

Methane intensity for oil and gas production: Key methodological considerations

February 2026

Foreword

In recent years, policymakers in many jurisdictions have sought to reduce harmful emissions of methane from the upstream oil and natural gas sector. The European Union's 2024 Methane Regulation seeks to do this in a number of ways, including setting penalties on imported oil and gas produced with higher methane emissions. This is done by requiring that those imports meet a *methane emissions intensity* standard. This report reviews the various formulae that have been used to calculate methane emissions intensity, with extensive discussion of the advantages and disadvantages of the various approaches. While the report clearly discusses these advantages and disadvantages, it does not recommend any one formula. The core purpose of this report is to assist Union policymakers in developing a fit-for-purpose standard by outlining a series of key considerations. Additionally, while the report focuses on the implications of methodological choices that are most relevant to the specifics of the EU methane regulation (for example, focusing on emissions intensity of oil/gas production, rather than emissions intensity of the entire oil/gas value chain), it also discusses intensity standards more generally, including approaches that may not be consistent with the specifics or the EU regulation, since other jurisdictions may approach emissions intensity standards differently.

1 Introduction

Methane is a greenhouse gas with a global warming potential (GWP) 82.5 times greater than that of carbon dioxide over a 20-year period;¹ therefore, it plays a pivotal role in accelerating climate change. Recognizing the urgency to mitigate methane emissions in the energy sector, the European Union adopted in June of 2024 a regulation on the reduction of methane emissions in the energy sector.² This regulation introduces requirements for monitoring, reporting, verifying and mitigating methane emissions, for all producers or importers placing oil, gas, or coal on the EU market.

Among its provisions, the regulation mandates that producers compute and report *methane intensity* for their oil and gas operations, a metric that represents the amount of methane emissions relative to a specific amount of oil or gas. The precise methodology for calculating this intensity has not yet been defined. However, it is explicitly stated in the regulation text² that the methodology will be published in 2027.

Methane intensity is a clear concept, but there are a number of different specific ways of calculating that intensity.^{3,4} While these various approaches are all relatively straightforward, it is nonetheless important to explore the different approaches, which can have differing impacts. Hence, the purpose of this white paper is to inform relevant parties about the key methodological considerations for defining a specific methane intensity formula, in order to have a consistent methodology across producers. It explores the various approaches, evaluating their advantages, limitations, and implications for stakeholders. The analysis considers critical trade-offs, including simplicity, accuracy, and applicability, while examining challenges such as granularity, allocation methods, or units of output.

To ensure that critical stakeholders' views were thoroughly represented in this white paper, two workshops were hosted, bringing together approximately 80 participants from diverse backgrounds, including industry, NGOs, government bodies, and other institutions. These workshops were designed to facilitate in-depth discussions and incorporate a broad range of perspectives on the methodological questions addressed in this paper. All aspects of these discussions were considered in this analysis, offering a broad view of the considerations necessary for a robust and transparent methane intensity framework. Further information about these workshops, as well as the organizations represented, are presented in annex 5.1. The elements presented in this paper may not reflect the individual viewpoints of the stakeholders or their affiliated organizations.

2 Context and existing methodologies

2.1 EU Methane Regulation

In December 2021, the EU Methane Regulation was proposed as part of the efforts to implement the European Green Deal. This proposal built upon the EU Methane Strategy adopted in 2020, where the EU pledged to take swift action to address methane emissions. The European Council adopted the final *Regulation of the European Parliament and of the Council on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942* ("Regulation") on May 7, 2024, and the Regulation

¹ Masson-Delmotte, V, et al., *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*, 2021, <https://www.ipcc.ch/report/ar6/wg1/>

² This paper only focuses on oil and gas. Considerations regarding with the methane intensity of coal are detailed in a separate paper.

³ Johnson, M., et al., *Methane by the Numbers: The Need for Clear and Comparable Methane Intensity Metrics*, 2025, <https://doi.org/10.31223/X5X16D>.

⁴ Gordon, D., et al., *Establishing Measures to Achieve Near-Zero Methane Waste from Global Oil and Gas Asset*, 2025, <https://rmi.org/establishing-measures-to-achieve-near-zero-methane-waste-from-global-oil-and-gas-assets/>

went into force on August 4, 2024.⁵ This Regulation specifically targets methane emissions from oil, gas, and coal production within the EU. It mandates compliance for operators producing or entities importing these resources within the Union's 27 member states, covering any oil, gas, and coal placed on the EU market.

This EU Methane Regulation establishes several Monitoring, Reporting, and Verification (MRV) and mitigation obligations, with certain measures applying to imported fossil fuels and domestic production, and certain measures only applying to domestic production. Domestic producers must meet:

- **Monitoring, Reporting and Verification (MRV):** Operators are required to report yearly their methane emissions at the source level, progressively implementing more specific measurements and site-level assessments over several years. In terms of quantification methodologies, this aligns with the OGMP2.0 (Oil and Gas Methane Partnership 2.0) methodology and is expected to be supported by EU-defined reporting templates and standards.

The EU Methane Regulation also specifies verification requirements, mandating third-party verification by accredited verifiers who operate autonomously from both competent authorities and reporting producers.

- **Mitigation Obligations:** Operators within the EU are mandated to implement robust mitigation measures, including a prohibition on routine flaring and venting except in emergencies, ensuring flare efficiency surpasses 99%, and conducting mandatory regular leak detection and repair (LDAR), and other specific measures to reduce methane emissions.

Economic penalties for non-compliance will be determined by each Member State, providing enforcement for these requirements.

As stated in the regulation, the European Union is heavily dependent on imports for its fossil fuel consumption. The EU Methane Regulation thus extends certain requirements to products placed on the European market by importers. To address emissions from imported fossil fuels, it mandates:

- **Data Reporting Obligations:** From May 2025, importers placing fossil fuels on the EU market are required to provide data on its origins, countries through which it was transported, as well as available data on mitigation efforts and its latest reports on emissions, including how measurements were quantified.
- **MRV Equivalence:** From January 2027, importers placing fossil fuels on the EU market must demonstrate to the competent authorities of their Member State that their supply contracts (concluded or renewed on or after August 4, 2024) for crude oil and natural gas produced outside the Union involve only products subject to producer-level monitoring, reporting, and verification measures that are equivalent to those set out in the EU Methane Regulation or OGMP 2.0 level 5.

⁵ European Parliament and Council, *Regulation (EU) 2024/1787 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942*, Official Journal of the European Union, 13 June 2024, <https://eur-lex.europa.eu/eli/reg/2024/1787/oj>

Importers and producers within the EU share the same methane intensity reporting obligations, which will be set forth in a methodology adopted by the European Commission through a delegated act by 5 August 2027. Starting on 5 August 2028, both importers and domestic producers must report according to this methodology. Then, all supply contracts concluded or renewed after 5 August 2030 will have to demonstrate that the methane intensity of the imported products are below a maximum intensity value. Importers must ensure that the necessary information for reporting to competent authorities is obtained from the entities with which they have direct contractual relationships in third countries, regardless of those entities' role in the production of the product.

While many aspects are specified, certain items or methodologies are still to be defined by the EU Commission (non-exhaustive list):

- Reporting templates for operators (Art. 12.4). Until then, OGMP 2.0 guidance and templates are to be used.
- A global methane monitoring tool and a rapid reaction mechanism, to monitor and respond to high methane-emitting events globally (Art. 31.1 and 31.2).
- Minimum detection limits and detection techniques for leak detection and repair (Art. 14.7).
- **Methodology for calculating, at the level of the producer, the methane intensity of the production of crude oil, natural gas and coal placed on the Union market (Art. 29.4).**
- Maximum methane intensity values associated with crude oil, natural gas and coal placed on the Union market at the level of the producer (Art. 29.6).

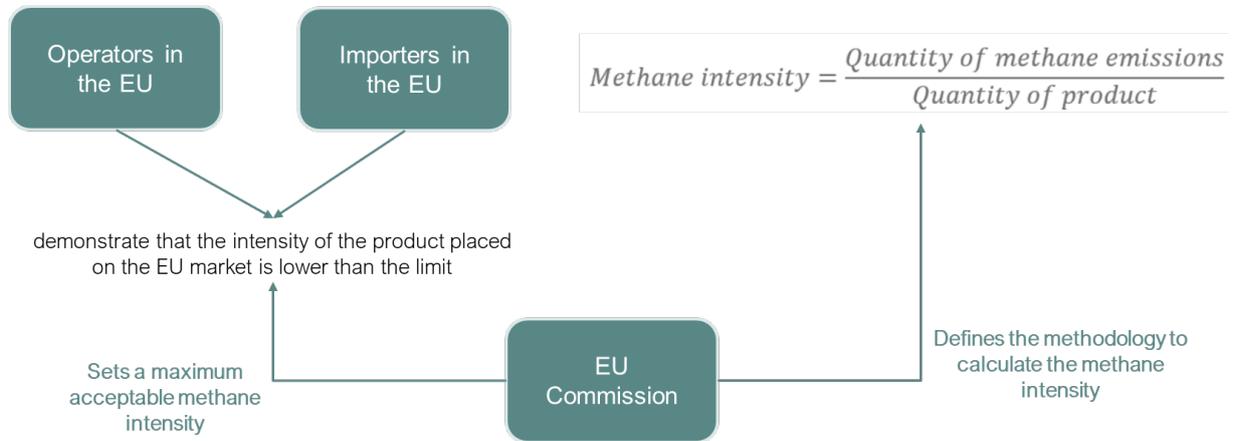
This white paper analyses the different elements that need to be addressed when defining a methodology to calculate methane intensity of oil and/or gas production. Indeed, Article 29.4 of the EU Methane Regulation states that:

By 5 August 2027, the Commission shall adopt a delegated act in accordance with Article 34 to supplement this Regulation by setting out the methodology for calculating, at the level of the producer, the methane intensity of the production of crude oil, natural gas and coal placed on the Union market. That methodology shall take into account different production processes and site conditions, as well as existing international methodologies and best practice for calculating methane intensity. That methodology shall be non-discriminatory and based on transparent and objective criteria. When preparing such delegated acts, the Commission shall inform the Coordination Group for oil and petroleum products, the Gas Coordination Group, the Electricity Coordination Group and other relevant stakeholders.

While Article 29.4 refers to 'methodology' in a singular form, the stipulation to take different production processes into account necessitates specific, product-appropriate methodologies for each fuel (oil, gas, and coal). Figure 1 simplifies these methodologies into one, in order to illustrate the role of the EU commission in establishing the methodology to compute methane intensity, as well as defining methane intensity thresholds. It also shows that both producers in the EU and importers of oil, gas, and coal into the EU will need to use these methodologies and prove they meet the methane intensity thresholds, in order for their products to comply with the EU Regulation. The methane intensity methodology is also an essential part of the implementation of the EU Regulation, as it is part of the criteria to set basic standards for harmonising how MRV data is analysed and compared to show that oil and gas cargoes meet the intensity thresholds that will be set in 2029. Beyond the scope of this single regulation, upstream methane emissions estimated as a result of this regulation will be used in life-cycle assessments of low-carbon fuels such as hydrogen as

part of the EU Directive on common rules for the internal markets for renewable gas, natural gas and hydrogen.⁶ This perspective should be accounted for in the design of the methane intensity methodology.

Figure 1 - Role of the EU Commission in further defining methodology and maximum thresholds for methane intensity, and impact on producers and importers of oil and gas in the EU.



This white paper will discuss the various technical aspects to consider when defining this methodology, including their impact on methane intensity results and the pros and cons of each approach.

2.2 Existing methane intensity calculation methodologies

Various methodologies exist for calculating methane intensity in oil and gas production. Each framework employs unique equations with various choices for numerator, denominator, scope, and output units, making comparisons challenging. This can create confusion as to what the methane intensity value intends to represent. The diversity of intensity metrics also reflects the diversity of their applications, with some focusing on specific segments of the value chain, on specific products or on ease of communications. Below, some of the most widely used approaches and their key characteristics are summarized. Other existing metrics are shown in annex 5.2.

Oil and Gas Climate Initiative (OGCI) Methodology

The Oil and Gas Climate Initiative (OGCI) is a CEO-led coalition of 12 leading global energy companies, collectively responsible for producing approximately a third of the world’s oil and gas.

Each OGCI member company annually reports a set of standardized data, which is aggregated into key performance indicators that monitor OGCI’s progress towards public commitments.

One of the key indicators is the upstream methane intensity, which is defined as the total volume of methane emissions from oil and gas production across all OGCI companies, divided by the total volume of marketed natural gas from these companies.⁷

$$\text{Methane intensity [\%]} = \frac{\sum_{\text{all OGCI companies}} \text{Methane emissions [Standard m}^3\text{]}}{\sum_{\text{all OGCI companies}} \text{marketed natural gas [Standard m}^3\text{]}}$$

⁶ European Parliament and Council, *DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on common rules for the internal markets for renewable gas, natural gas and hydrogen, amending Directive (EU) 2023/1791 and repealing Directive 2009/73/EC (recast)*, Official Journal of the European Union, 13 June 2024, <https://eur-lex.europa.eu/eli/dir/2024/1788/oj/eng>

⁷ Oil & Gas Climate Initiative (OGCI), *Reporting Framework*, October 2023, https://www.ogci.com/wp-content/uploads/2023/11/OGCI_Reporting_Framework_2023_-_FINAL_FINAL.pdf

The collective methane intensity target of 0.2%, set for 2025, applies specifically to the upstream, operated oil and gas sector.⁸ Included upstream activities are defined as from the wellhead to the point of sale, and including LNG liquefaction processes.

NGSI Methane Emissions Intensity Protocol

The Natural Gas Sustainability Initiative (NGSI) is a framework to recognize and advance innovative, voluntary methane management programs across the **natural gas** value chain.

The NGSI protocol details a methodology for companies to consistently calculate and report methane emissions intensity and provides data reporting templates for each of the following segments of the natural gas value chain: production, gathering & boosting, processing, transmission & storage, and distribution. This segmented approach ensures comparability within similar operational contexts, such as production or transmission, allowing for accurate benchmarking among companies in each sector. Methane intensity within the production segment is calculated by dividing the mass of methane emissions allocated to gas production and, all other segments, to gas throughput, by the mass of methane contained in the natural gas throughput.⁹

$$\text{Methane Intensity [\%]} = \frac{\text{Methane Emissions [Mt]} * \text{Gas Ratio}}{\text{Natural Gas Throughput [mcf]} * \text{Methane Content} * \text{Unit conversion factor [Mt/mcf]}}$$

Gas Ratio: NGSI is exclusively focused on the natural gas value chain. Since production, gathering & boosting, and processing segments can produce and handle multiple hydrocarbon liquids, the Protocol includes a methodology for allocating a fraction of total site emissions to the natural gas value chain on an energy basis (i.e., comparing the energy content of the different products such as gas, oil, natural gas liquids (NGLs), or other hydrocarbon liquids). The gas ratio is calculated as the energy content of natural gas divided by the energy content of natural gas plus the energy content of other hydrocarbons. Default energy content values are given (specific to each segment of the value chain) if a company-specific factor is not available. Because the transmission & storage and distribution segments only transport and deliver natural gas on their systems, there is no need to allocate emissions according to each product that gets produced and handled, thus the gas ratio is set at 1 or does not appear in the equation for those segments.

The denominator is multiplied by a conversion factor to transform the volume of methane into its mass. This unit conversion factor is specified in the protocol as 0.0192 metric tons of methane per thousand cubic feet. Default values for methane content are also given, as methane content of gas will vary across different segments.

The NGSI Protocol's builds on existing reporting protocols developed by the EPA. Organizations like MiQ and Veritas have endorsed the NGSI protocol.

Other methodologies, like the one developed by Context Labs¹⁰, build on the one presented in the NGSI protocol with the addition of a Liquid Ratio for the tracking of methane intensity for liquid products. The Liquid Ratio is exactly analogous to the Gas Ratio discussed above.

⁸ While only using marketed gas in the denominator, this metric applies to oil and gas in the sense that it aggregates all upstream emissions of the companies into a single number used for corporate accounting.

⁹ Edison Electric Institute (EEI) and American Gas Association (AGA), *Natural Gas Sustainability Initiative Methane Emissions Intensity Protocol Version 2.0*, September 2024, https://www.eei.org/-/media/Project/EEI/Documents/Issues-and-Policy/NGSI_MethaneIntensityProtocol.pdf#:~:text=Version%202.0%20of%20the%20NGSI,included%20in%20the%20NGSI%20Protocol.

¹⁰ Context Labs, Emissions quantification methodology, V. 2.4, August 2024, https://go.contextlabs.com/l/994532/2025-01-08/sv989/994532/1736362789FrF61STD/CXL_Natural_Gas_Methodology_v2_4.pdf

International Energy Agency (IEA) Methodology

The IEA uses two formulas with a different output unit that are effectively the same, both conveying the same relationship between methane emissions and energy output. This flexibility allows for easier comparison and alignment with different reporting standards or contexts. The first formula is used to set the target of the Net Zero Emissions by 2050 Scenario (NZE), giving intensities in percentages.¹¹ The second one, from the 2024 Global Methane Tracker¹², presents methane intensity as kilograms of methane emissions per gigajoules of energy produced. Both formulas divide the total methane emissions from oil and natural gas supply by the total oil and gas production but use different units in their calculations.

$$\text{Methane Intensity [\%]} = \frac{\text{Total methane emissions from oil and natural gas supply [MJ]}}{\text{Total oil and gas production (energy) [MJ]}}$$

or

$$\text{Methane Intensity} \left[\frac{\text{kg CH}_4}{\text{GJ}} \right] = \frac{\text{Total methane emissions from oil and natural gas supply [kg CH}_4\text{]}}{\text{Total oil and gas production (energy) [GJ]}}$$

To convert the total methane emissions from weight to energy, IEA uses an energy density for pure methane of 55 megajoules per kilogram. Methane intensity can also be computed only for natural gas or only for oil, using the same formulas.

EPA Waste Emissions Charge (WEC) methodology

In 2022, the U.S. Congress passed the Inflation Reduction Act (IRA), establishing the Methane Emissions Reduction Program (MERP). MERP includes \$1.55 billion in funding for programs to reduce methane emissions from the oil and gas industry and mandates an annual methane Waste Emissions Charge (WEC) on facilities that report to the GHG Reporting Program (GHGRP) over 25,000 metric tons of CO_{2e} per year and exceed segment-specific methane intensity thresholds.¹³

The program sets intensity thresholds specific to each industry segment, calculated at the facility level by dividing methane emissions by the relevant gas throughput metric for each segment. For upstream facilities (with natural gas sales), midstream facilities, and downstream facilities, the denominator is the *amount of natural gas sent to sale from or through facility*. The thresholds are 0.20% for production facilities, 0.05% for onshore gathering and boosting facilities and LNG storage and loading/unloading facilities, and 0.11% for natural transmission and underground storage facilities. For onshore and offshore petroleum and natural gas production facilities that send no natural gas to sales, the threshold is 10 metric tons of methane per million barrels of oil sent to sale from the facility.

$$\text{Natural Gas Production Methane Intensity [\%]} = \frac{\text{Methane emissions}}{\text{Natural gas sent to sale from facility}}$$

$$\text{Oil Production Methane Intensity} \left[\frac{\text{tons}}{\text{Mbbbl}} \right] = \frac{\text{Methane emissions [tons]}}{\text{Oil sent to sale from facility [Mbbbl]}}$$

¹¹ International Energy Agency, *The Oil and Gas Industry in Net Zero Transitions, World Energy Outlook Special Report*, 2023, <https://iea.blob.core.windows.net/assets/f065ae5e-94ed-4fcb-8f17-8ceffde8bdd2/TheOilandGasIndustryinNetZeroTransitions.pdf>

¹² International Energy Agency, *Global Methane Tracker*, 2024, <https://www.iea.org/reports/global-methane-tracker-2024>

¹³ Environmental Protection Agency (EPA), *Federal Register / Vol. 89, No. 18 / Proposed Rules. Waste Emissions Charge for Petroleum and Natural Gas Systems*, Friday, January 26, 2024, <https://www.govinfo.gov/content/pkg/FR-2024-01-26/pdf/FR-2024-01-26.pdf>. Due to actions by the US Congress in 2025, the rule implementing the Waste Emissions Charge has been removed and is no longer in force.

Oil Climate Index plus Gas (OCI+)

The OCI+ is a systems tool that combines bottom-up modeling and top-down measurements to assess methane and other GHG emissions intensities from oil and gas production, processing, refining, shipping/storage, and end-uses worldwide. OCI+ methane intensity is reported at the sub-basin or field level in units of kg of methane per barrel oil equivalent (oil and gas). For comparison, OCI+ also presents (1) gas loss rate, and (2) converts volumetric methane intensity to units of kg methane per MJ, the denominator used by IEA.¹⁴

$$\text{Methane Intensity} \left[\frac{\text{kg}}{\text{boe or MJ}} \right] = \frac{\text{Methane emissions [kg]}}{\text{Total oil and gas energy production [boe or MJ]}}$$

Environmental Defense Fund (EDF) Methodology

In some of its publications, the Environmental Defense Fund (EDF) calculates methane intensity as the total methane emissions from oil and gas production (in CH₄ volume) divided by the volume of production, a method similar to that of OGCI but based on total production rather than marketed volumes.¹⁵

$$\text{Methane Intensity [\%]} = \frac{\text{Methane emissions [m}^3\text{]}}{\text{Natural gas produced [m}^3\text{]}}$$

Other intensity methodologies

Some intensity methodologies take a broader approach by considering greenhouse gas (GHG) emissions, rather than focusing solely on methane.¹⁶ One example of this broader approach is the intensity presented in the 2023 Colorado Air Quality Control Commission (AQCC) rule in the United States, which sets greenhouse gas intensity standards for oil and gas production.

The rule specifies year-specific GHG intensity targets applicable to each Colorado upstream operator. GHG intensity must be calculated as the preproduction and production GHG emissions during that year, in mass of CO₂e, divided by the total oil and natural gas production for that year, expressed in energy terms.¹⁷

Summary

Numerous companies, industry associations, and organizations define their own methods for calculating methane intensity, leading to a complex landscape of varying formulas and recommendations. Some approaches focus solely on upstream activities, while others cover the entire value chain, from production through distribution. Methodologies also differ in product: some calculate methane intensity by comparing total oil and gas emissions against combined oil and gas production, while others limit the calculation to natural gas emissions and production alone. Most metrics only consider methane emissions, but one considers greenhouse gases as a whole. The choice of **denominator** varies as well, some organizations use marketed natural gas, while others base the calculation on total oil and gas production, which can be expressed in energy terms, volume or mass. Additionally, conversion factors are applied: certain methodologies adjust emissions to CO₂e or energy content, while others do not.

¹⁴ Rocky Mountain Institute, *Oil Climate Index + Gas Methodology*, 2024, <https://ociplus.rmi.org/methodology/#introducing>

¹⁵ Environmental Defense Fund, *Plugging the leaks, An investor guide to Oil and Gas Methane Risk*, 2023, https://business.edf.org/wp-content/blogs.dir/90/files/EDF_Methane101_Oil-and-Gas.pdf

¹⁶ Roman-White, et al., *Gas Pathing: Improved Greenhouse Gas Emission Estimates of Liquefied Natural Gas Exports through Enhanced Supply Chain Resolution*, 2024, <https://doi.org/10.1021/acssuschemeng.4c07162>

¹⁷ Department of Public Health and Environment, Air Quality Control Commission, Colorado Air Pollution Control Division, *REGULATION NUMBER 7 Control of Emissions from Oil and Gas Emissions Operations, 5 CCR 1001-9, PART B section VIII*, 20 July 2023, <https://cdphe.colorado.gov/aqcc-regulations>

In the industry but also in the scientific literature, “methane intensity” serves as a broad term encompassing diverse formulas and scopes. Table 1 below summarizes the widely used methods for calculating methane and GHG intensities, as discussed earlier in the paper, and highlights their scopes, output units, and the quantities used in the numerator and denominator of the formulas.

Table 1 – Overview of existing methods for calculating methane and GHG intensities in the oil and gas sector

	Product/Segment	Numerator	Denominator	Unit of output
OGCI & EDF	Upstream oil and natural gas	Methane emissions from oil and natural gas production - volume	Marketed (OGCI) or produced (EDF) natural gas - volume	%
NGSI	Natural gas – per segment	Methane emissions attributed to natural gas production - mass	Methane in the natural gas throughput - mass	%
IEA & OCI+	Oil and natural gas – all segments	Total methane emissions from oil and natural gas supply – energy (IEA) or mass (IEA, OCI+)	Total oil and gas production - energy	% or $\frac{\text{kg CH}_4}{\text{GJ}}$
EPA WEC	Oil and natural gas – all segments Separate formulas for oil and natural gas	Facility’s methane emissions – mass or volume	Oil or natural gas sent to sale from facility – energy (oil), mass or volume (gas)	Natural gas: % Oil: $\frac{\text{tons}}{\text{Mboe}}$

The objective of the remainder of this paper is to critically evaluate these various approaches, systematically analyzing the advantages and limitations of each and to provide a clearer understanding of their implications and practical applicability.

3 Key considerations

This section outlines the main considerations for the development of an informed methodology to calculate methane intensity. It highlights the impact and implications of different options that can be considered for the development of a methane intensity formula, as well as requirements for the parameters necessary to compute methane intensity. The different elements are presented in different subsections, where the benefits and limitations of potential approaches are detailed to inform the development and selection of a methane intensity formula. Summaries of the different topics covered are presented below.

1. **Using single or separate formulas for oil and gas methane intensity:** This section discusses the pros and cons of adopting a single formula to calculate methane intensity for both oil and gas versus using separate formulas. It highlights issues such as allocation challenges, simplicity versus specificity, and the impact of different denominators. As noted below, using the same formula for both oil and gas intensity does not imply that the same numeric value should be used as the threshold for a performance standard for oil and gas. In general, under any formulation, a single numeric value for a performance standard will have dissimilar stringency for oil and natural gas.
2. **Produced vs. marketed product:** This subsection evaluates the implications of using either the amount of "produced" or "marketed" products in the denominator of methane intensity formulas. It examines how this choice can affect reported intensity values and incentivize mitigation.
3. **Granularity:** This subsection explores the implications of calculating and reporting methane intensity at various levels of granularity, from facility-level to national-level aggregations. It discusses the advantages and disadvantages of adopting high granularity versus low granularity for reporting.

4. **Scope of the production activities:** Defining clear boundaries for "production" is crucial for developing a methodology that ensures comparability between producers. This subsection evaluates the inclusion of various operational stages, such as extraction and processing, and their impact on achieving transparency and consistency across methane intensity methodologies.
5. **Gas volume vs. methane volume:** Another important consideration is whether to base methane intensity on total quantity of gas released, or quantity of methane. This subsection examines the implications of each approach for representativeness, alignment with emissions reduction goals, and practicality.
6. **Units of output:** The methane intensity can be computed and reported as a percentage or with different units such as mass per energy. This choice can shape the clarity and comparability of methane intensity methodologies. This subsection explores the advantages and limitations of different units for the intensity.
7. **MRV considerations:** Ensuring accurate and credible reporting requires robust MRV systems. This subsection discusses the importance of precise data collection, independent verification, and transparent methodologies to uphold regulatory and stakeholder confidence.

3.1 Using single or separate formulas for oil and gas methane intensity

Calculating methane intensity can be done by having separate formulas for oil and for gas or having a single formula that can be used for both energy products.

The formulas are *separate* when allocation of emissions to each of the two products is required, which results in two different formulas: one focusing exclusively on oil and the other focusing exclusively on gas. Allocation refers to the process of attributing a share of the emissions to one or the other of the products.¹⁸ When oil and gas are produced together, as they often are, it is not always possible to physically differentiate between methane emissions that are caused by oil production and methane emissions that are caused by gas production.

On the other hand, a *single* formula does not allocate the methane emissions to gas or to oil, but instead considers all methane emissions from production per unit of produced volume (of one product), mass or energy (of all products).

Depending on the type of facility, oil and gas may be produced independently or together, with facilities focusing on putting either or both on the market. Figure 2 to Figure 4 give a simplified representation of product flows for a producer sending only oil to market ("Oil producer"), for a producer sending only gas to market ("Gas producer") and for a producer sending both products to market ("Oil and gas producer"). The methodology for methane intensity calculation should be designed so that it applies to all types of situations and accounts for all emissions in oil and gas facilities. This discussion is mostly relevant for the "Oil and gas producers" because the main difference between the two approaches is the need for allocation. For simplicity, the following discussions focus on oil and gas, but there may be other types of products coming out of the facilities, such as natural gas condensates, that should not be overlooked in the methane intensity calculation.

¹⁸ Zavala-Araiza, D., et al., *Allocating Methane Emissions to Natural Gas and Oil Production from Shale Formations*, 2015. <https://doi.org/10.1021/sc500730x>

Figure 2 – Simplified product flows for a producer-only marketing oil.

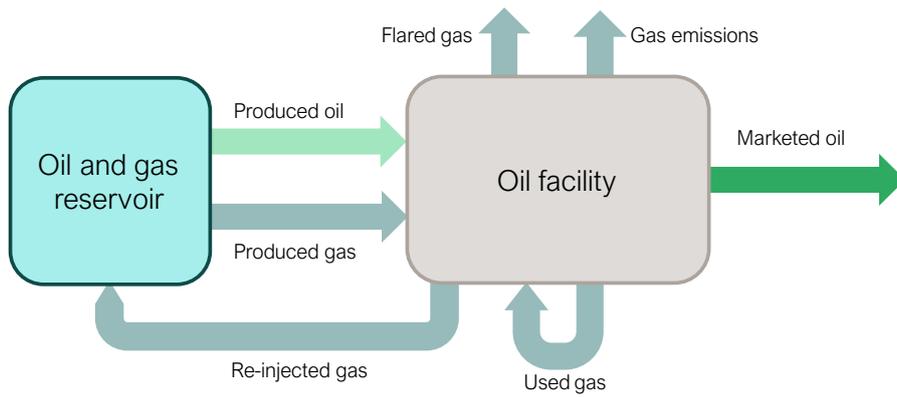


Figure 3 – Simplified product flows for a producer-only marketing gas.

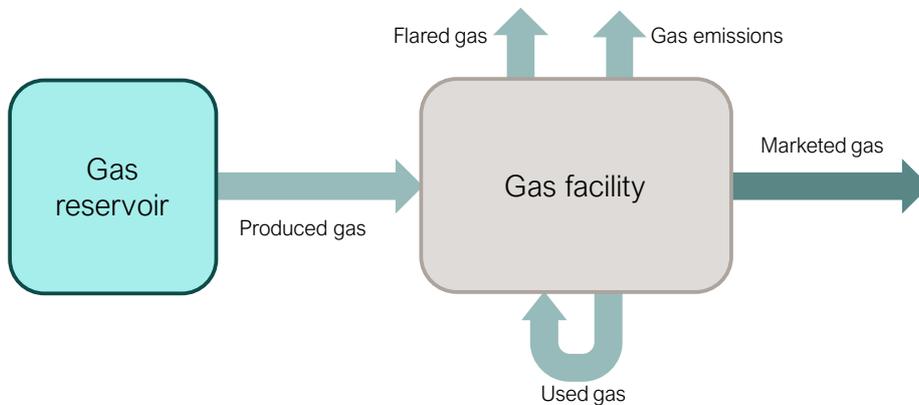
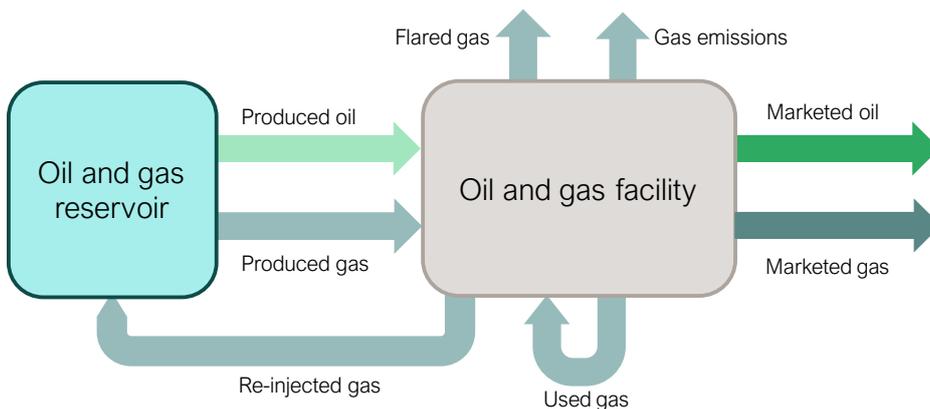


Figure 4 – Simplified product flows for a producer marketing oil and gas.



Note: The size of arrows was set arbitrarily and does not necessarily reflect the average relative importance of the flows. Some arrows may not be relevant for all producers. For simplicity, other products such as natural gas condensates are not represented.

In the following sub-sections, when not specified, “the products” can refer either to the produced volumes or the marketed volumes. The distinction between produced and marketed product is not relevant for the points developed in this section. The implications of choosing produced or marketed products in the formulas are discussed in Section 3.2.

Single formula

One solution is to calculate a single intensity by producer that will apply to all products marketed by the producer (oil, gas and by extension condensates and other products).

With this approach, methane intensity is calculated by dividing all methane emissions of the producer at the defined granularity (see Section 3.3) by a quantity of product. The result of this calculation is the value reported as intensity for both the oil and the gas marketed by the producer.

The main advantage of this approach is its simplicity. In the case of mixed production, this approach does not require allocating emissions to oil and to gas. This could limit the number of parameters to measure and communicate for verification. With no allocation process, the approach may be less vulnerable to error or manipulation. On the side of importers and producers, a unique methane intensity value is associated with the volume from each producer, at the defined level of granularity, whether they produce oil, gas, or both.

On the flip side, using a single formula may be interpreted as considering oil and gas as equivalent products that fill the same purpose (delivering energy). In practice, however, oil and gas are often intended for different uses and generally do not compete in the market. This distinction is particularly relevant when it comes to trade as importers will import oil and gas cargos separately and market these products individually. Depending on the level of granularity (see Section 3.3), using a single formula may also mask that the production of one product is responsible for more emissions than the other product.

One of the main challenges of using a single formula lies in the choice of denominator, that must then encompass oil and gas. A method used by several institutions such as the IEA, the OCI+ and the Colorado AQCC rule is to divide methane emissions by the total energy contained in the products (*i.e.*, the sum of the energy contained in the oil and the energy contained in the gas). This approach aligns with the fact that the primary activity of companies producing oil and gas is to provide energy. As such, this approach may be more straightforward when applied to companies within a jurisdiction (as in the Colorado AQCC rule) or as a general standard or evaluation metric for oil and gas producers (as in the OCI+ and IEA methodologies). In contrast, this approach is not as straightforward for an import standard for oil or gas, which are separated products when imported. Finally, this approach also allows inclusion of products beyond crude oil and gas (such as condensates or refined products) based on their energy content. Major challenges tied to using energy content in the denominator are addressed in Box 1, along with nuances or mitigation strategies to those challenges.

Box 1 – Challenges of using energy content in the denominator

Understanding of the formula by a broad audience

Energy units are not always intuitive for individuals outside the energy industry (as opposed to mass or volume units), making them more difficult to understand and communicate effectively. On the other hand, operators generally define themselves as “energy companies” so using energy content might seem logical for a broad audience.

Verification

Verifiers would need to verify not only methane emissions but also the energy content of hydrocarbons, increasing the workload. While the energy content of gas is typically measured, it is often not publicly available, creating additional barriers to transparency. Oil (and to a lesser extent gas) can vary significantly in energy content per unit volume leaving more room for unclarity in the values used depending on the calculation requirements.

Those issues are, however, mitigated if standard conversion factors are used. Only the quantity of hydrocarbons would need to be verified. In certain jurisdictions (such as in certain U.S. states), another advantage of volume-to-energy conversion is that taxes and royalties are calculated using these units, which would facilitate rigorous auditing and documentation of production amounts for verifying methane intensity.

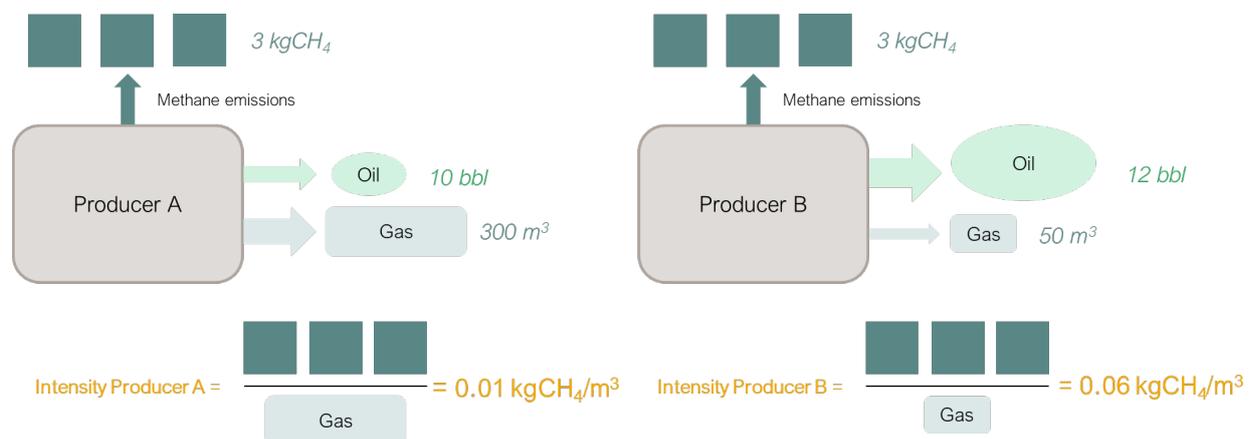
Other approaches are possible to group oil and gas in a unique denominator. For example, it is possible to consider the total mass of hydrocarbons or the total monetary value of the products. Those methods are however not common. It can be noted that using the mass of hydrocarbons generally faces the same challenges as using energy, as described in Box 1: the density of natural gas or oil can vary significantly hence requiring additional reporting and verification efforts. This issue can be mitigated by defining standard density conversion factors.

Alternatively, instead of accounting for both products, the denominator could exclusively take one of the products into consideration. This is the approach used by OGCI for corporate reporting and by the EPA Waste Emissions Charge (WEC) for calculation at facility level: the intensity of the company (OGCI) or of the facility (EPA WEC) equals the total methane emissions divided by the volume of (marketed) gas only. This method presents the following caveats:

- Product Volume Bias: Producers that produce more of the specific product used in the denominator will have lower methane intensities. For instance, as depicted in Figure 5 with a method mirroring the OGCI formula, for the same amount of methane emissions, if producer A markets more gas than producer B, producer A will have a lower intensity (even though producer B might produce more oil, and potentially more energy)
- Limited Applicability: Intensity cannot be calculated for producers that do not produce the selected product: an alternative option must be made available for those specific cases. That is the approach adopted by the EPA WEC, which contains a back-up approach for facilities that only market oil.

This type of formula might also be difficult to interpret for the other product which is not represented in the denominator. For example, with a method mirroring the OGCI methodology, oil placed on the market which has an intensity of 1% should be interpreted as “the oil is produced by a producer whose emissions equal 1% of the volume of gas they market”.

Figure 5 – Representation of intensity calculation for two oil and gas producers with a formula only using gas in the denominator



Note: The numbers are for illustrative purpose only and may therefore not represent typical intensities.

It is important to note that the use of a single formula for both oil and gas does not imply that a single intensity threshold – e.g. X kg CH₄ per GJ of fuel – should be used for both oil and gas. In general, a single threshold will have a dissimilar stringency for oil and gas. For example, a given quantitative threshold expressed as a methane loss rate (%) will be more stringent for oil volumes than for gas volumes, because producers whose main product is gas tend to capture a higher percentage of the gas they produce (alternatively, because they have a larger denominator because their wells simply produce more methane per unit of time). On the other hand, a specific quantitative threshold expressed as mass of methane per unit of produced or

marketed energy will be more stringent for gas than for oil.¹⁹ Therefore, it is generally not possible to set a single standard that would be roughly equally stringent for both oil and gas.

Separate formulas

Another solution is to calculate two separate methane intensities, one for oil and one for gas. This approach allows for product-specific intensity calculations that apply to an entire site, but only for sites that produce a single product, either gas or oil:

- For gas, the intensity could, for instance, be expressed as a volume of methane per volume of gas (similar to the OGCI methodology)
- For oil, the intensity could, for instance, be expressed as a mass of methane per energy produced (following the EPA WEC approach for facilities that do not market gas)

Nonetheless, this approach can make it challenging to determine the methane intensity of sites marketing both products; as discussed below, it would be necessary to apply the intensity separately for each product when using separate formulas. The estimated methane emissions from the site must then be allocated to each of the products. Several methods for allocation are possible and can lead to different results. Therefore, to ensure comparability between producers, allocation methods must be clearly defined in the methodology for calculating intensity. As such, while these approaches may be appropriate for standards for products (such as import standards), they may be more challenging to implement for standards for companies or jurisdictions.

As mentioned before, the goal of allocation is to attribute methane emissions to oil and to gas when they are produced together.

Emission source allocation

One method for emission source allocation consists of attributing emissions to oil or gas depending on the emission source. The main challenge lies in the allocation of emissions from associated gas venting. Indeed, associated gas stems from the production of oil. If captured, it can be marketed as gas, alongside non-associated gas. Therefore, it can be argued that emissions due to associated gas could be exclusively attributed to oil, or to the gas, or shared between both.

At a higher level of detail, allocation can be done depending on the type of equipment that is the emission source. Certain pieces of equipment, such as crude oil tanks, can be associated with the production of oil. On the other hand, some others, such as compressors or dehydrators can be associated with the production of gas. Therefore, if the quantification method allows to attribute emissions at component-level, which may not always be the case or may require some further analysis for top-down measurement methods, the emissions of these components can be allocated to oil or to gas. However, some emission sources (beyond associated gas venting), such as leaks and incomplete combustion, cannot be unequivocally attributed to one product. For those sources, a complementary approach based on calculation, as described below, may be required. Allocation based on the emission source could be considered as a fair way to distribute emissions between products. It is, however, a resource-intensive approach: producers must have a detailed inventory of emissions by emission source and make the correct attribution and summation to calculate the intensity of each product. Clear guidelines about how sources should be matched with products must be set to prevent arbitrary allocation at the level of the producer. This method requires detailed calculations based on the inventory at the facility level which increases the risk of mistakes and complicates verification work and may not be applied consistently across operators if the methodology is not clearly defined in the regulation.

¹⁹ See S.P. Seymour *et al.*, "Methane emission intensity metrics: unmasking the trade-offs," (2025), submitted to *Nature Portfolio*. <https://doi.org/10.21203/rs.3.rs-6753363/v1>.

Quantitative allocation: energy, mass, volume, or economic value

A simpler allocation method is to calculate the share of emissions attributed to each product based on a defined parameter. The rationale is that the burden borne by each product should be proportional to the importance of the product in the production mix. Typically, in carbon accounting frameworks, the importance can be evaluated based on different parameters: the energy delivered, the quantity (mass or volume) produced or the economic value.²⁰ As illustrated in Figure 6, for a same amount of total methane emissions, the choice of parameter for the allocation can alter the share of emissions allocated to each product. The methodology for methane intensity calculation must state the parameter used for allocation between different products, including condensates and NGLs where relevant, and define how this parameter is measured or evaluated (see Section 3.7). Even though several allocation parameters are theoretically possible, allocation based on energy content is the most used (e.g., NGSI, Context Labs). Indeed, this parameter best represents the service provided by the products (energy carriers) and is generally known by companies. Allocation based on economic value on the other hand is not linked to the physical properties of the products and can vary a lot through time, including over short time periods.

Allocation by facility-type or producer-type

Finally, it is possible to define separate formulas, not for different products but for different facility-types or, by extension, for different producer-types. That is how the EPA WEC rule is designed: the intensity is calculated per volume of marketed gas for all facilities that market gas, and by volume of marketed oil for facilities that only market oil. In this situation, two main points must be considered:

- The rules for determining which formula should be used must be clearly defined to prevent operators from arbitrarily choosing a method. Additional verification work would be required to ensure the right formula is used.
- The rules for determining which formula should be used, as well as the maximum intensities defined in the future, must give the right incentive to operators to mitigate emissions. For instance, a facility that only markets oil may be deterred from starting to capture and market the gas, if it entails the use of a less favourable formula. For example, if a facility starts marketing gas and is required to report its methane intensity using the gas formula, but doing so would result in a higher reported methane intensity due to its operations, the facility might opt to avoid capturing and marketing the gas, continuing instead to vent or flare it.

²⁰ Zavala-Araiza, D., et al., *Allocating Methane Emissions to Natural Gas and Oil Production from Shale Formations*, 2015. <https://doi.org/10.1021/sc500730x>

Figure 6 - Simplified representation of two allocation methods.

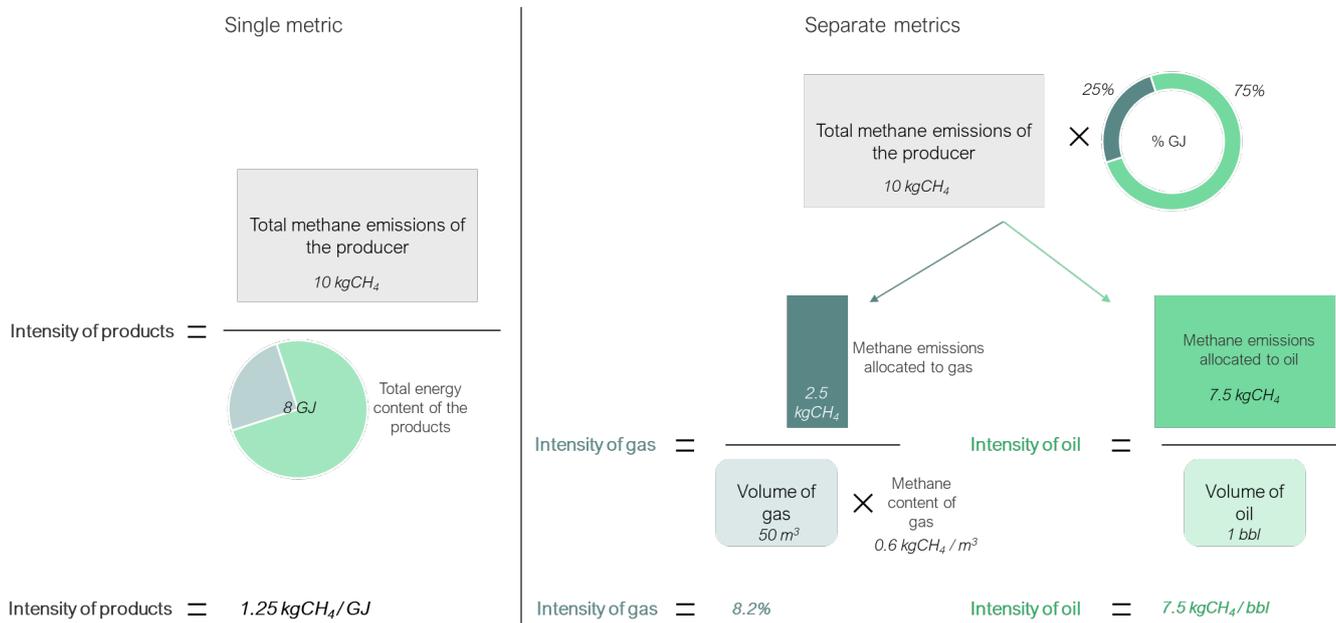


Note: The relative importance of oil and gas in each allocation method is purely for illustrative purpose.

Simplified example

This section illustrates how different types of methane intensity formulas can apply to the same producer. On the left-hand side of Figure 7, the intensity of oil and gas is calculated using a single formula based on the mass of methane emissions divided by the total energy produced. On the right-hand side, intensity is calculated using separate formulas. The allocation of methane emissions is based on the share of energy: in this fictional case, 25% of the energy produced comes from gas so 25% of the methane emissions are allocated to gas. In this example, it has been decided to express the intensity of gas as a percentage of the mass of methane contained in the (produced or marketed) gas. The intensity of oil is expressed with explicit units as a mass of methane divided by the volume of (produced or marketed) oil. The next section will clarify whether the volume or energy of product considered in the formula refers to produced or marketed products, but this distinction does not affect the logic of the calculations.

Figure 7 – Example of intensity calculations for a same producer using single and separate formulas



Box 2 – Anticipating risks created by methodological choices

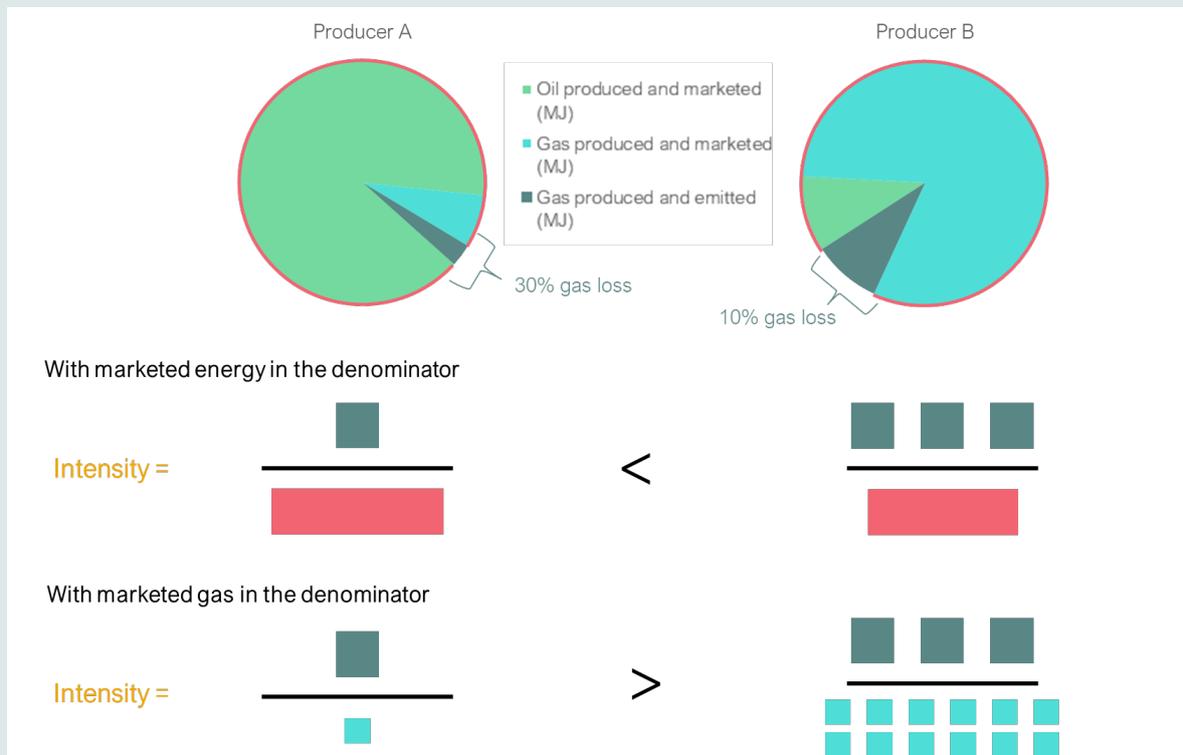
Oil and gas producers tend to produce a mix of oil and of gas. However, the share of products can vary greatly between producers, ranging from very oil-dominant producers to very gas-dominant producers. The choice of methane intensity formula can, in some cases, distort the comparisons between producers.

A simplified example is given in Figure 8: it shows two producers that produce the same total energy and have different production profiles. On the right-hand side, Producer A produces mainly oil and 30% of the gas extracted is emitted. On the left-hand side, Producer B produces mainly gas, and 10% of the gas extracted is emitted. When calculating intensity with the total energy marketed in the denominator, Producer A has a lower intensity because this metric favors the producer that has less emissions for a similar level of energy marketed. On the contrary, when the intensity is calculated with the marketed gas in the denominator, Producer B has a lower intensity because this metric favors the producer that is the most “gas efficient”, *i.e.*, for which a smaller share of the extracted gas is emitted.

Even with carefully designed formulas, distortions such as these may not be avoidable when using a unique metric. It may therefore be relevant to carry out in-depth analysis of the profiles of the main exporters to the EU to determine which type of metric will incentivize the largest emission reductions.

For simplicity, the example given in Figure 8 relies on a single formula, with two calculation methods. Using separate formulas with an energy-based allocation would lead to the same results as the single formula with energy in the denominator: the intensities for oil and for gas of Producer A would be lower than the intensities of Producer B.

Figure 8 – Example of intensity calculation with different denominator for two producers with different production profiles



Note: The numbers and ratios between numbers are purely for illustrative purpose and do not represent average values for oil and gas producers.

Summary

Single formula	
Pros	Cons
<ul style="list-style-type: none"> - Does not require allocation of emissions between products. - Representative of most cases as oil and gas are often produced together. - Non-expert stakeholders only need to become acquainted with one formula. - Applies beyond the scope of crude oil and gas: can include condensates and refined products. 	<ul style="list-style-type: none"> - If the denominator is based on the volume of one product, the interpretation might be counter-intuitive for the other product.

Separate formulas	
Pros	Cons
<ul style="list-style-type: none"> - Burdens can be more fairly split between products based either on the reality of operations or on the total energy that each product delivers. 	<ul style="list-style-type: none"> - Allocation of emissions at the level of assets can be challenging for operators. - Allocation of emissions could require multiple parameters that must be monitored, which complicates verification.

The use of single or separate formulas is a key question when designing a methane intensity methodology with many considerations regarding data requirements and specific cases. Additionally, the formula design can introduce a potential advantage for certain production profiles. A more complete picture could be reached by using two metrics conjointly. In any case, when combining oil and gas (for a single formula) or allocating emissions to each of these products (for separate formulas), it is recommended that energy content of the produced products is taken into consideration rather than other factors such as monetary value or volume.

3.2 Produced vs. marketed product

Among the currently used methane intensity formulas, there is a divergence between the use of produced or marketed product in the denominator. For example, the OGCI and the EPA WEC formula use marketed product as a denominator, while EDF and NGSi consider produced product (see Section 2.2).

This choice can have an impact on the ultimate value of the methane intensity but also has implications depending on the type of practices implemented at different sites. This section reviews the effects of selecting produced or marketed product to calculate the denominator.

Produced product

One option for producers is to use the amount of product that is produced as the denominator to calculate their methane intensity.

Produced product corresponds to the amount of product that is extracted from the well, before it undergoes any further processing at the production facilities. Given that this value is necessarily larger than the volume of marketed product, using it in the denominator will tend to result in lower methane intensities.

An additional point to consider is that flow volumes from the well might not always be precisely metered and that some leaks, venting (e.g. casinghead gas venting), use, pre-processing or re-routing of the gas (e.g. for reinjection) can occur before the first point of metering. Therefore, for some producers, granular or accurate production data can be challenging to obtain.

Marketed product

Another option for producers is to use the amount of product that is sold as the denominator to calculate their methane intensity.

Marketed product corresponds to the amount of product that is exiting a facility and is made available to the market. This is the amount of product that will be found in sales contracts and that is typically metered by the buyer. This approach might better reflect the contractual arrangements typically in place between seller and buyer entities.

Given that this value is necessarily smaller than the volume of produced product, this will tend to result in higher methane intensities. These intensities are also the most relevant for life-cycle analyses in other sectors. Therefore, using marketed product for calculating methane intensity could be advantageous if this value is used beyond the EU Methane Regulation.

If the option of a single formula only using gas volumes at the denominator is selected (see Section 3.1), the use of marketed gas as a denominator could be challenging for companies marketing mainly or only oil. Due to small values for the denominator, this could lead to very high methane intensities or even methane intensities which are impossible to compute for these producers.

The amount of marketed product is generally a value that is easy to obtain as metering is typically available on all sales pipelines exiting a production facility, as it is necessary for sales agreements, trade contracts, and in many cases, taxation purposes.

Simplified example

Produced product corresponds to the sum of product that is marketed, used on site, flared, re-injected and emitted. Therefore, there is a relationship between these two values illustrated in Figure 9.

Figure 9 - Illustration of the relationship between produced gas, marketed gas, methane emissions (vents and leaks) and used, flared or reinjected gas

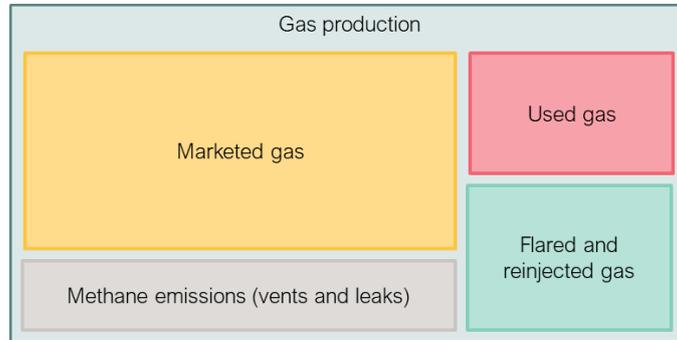
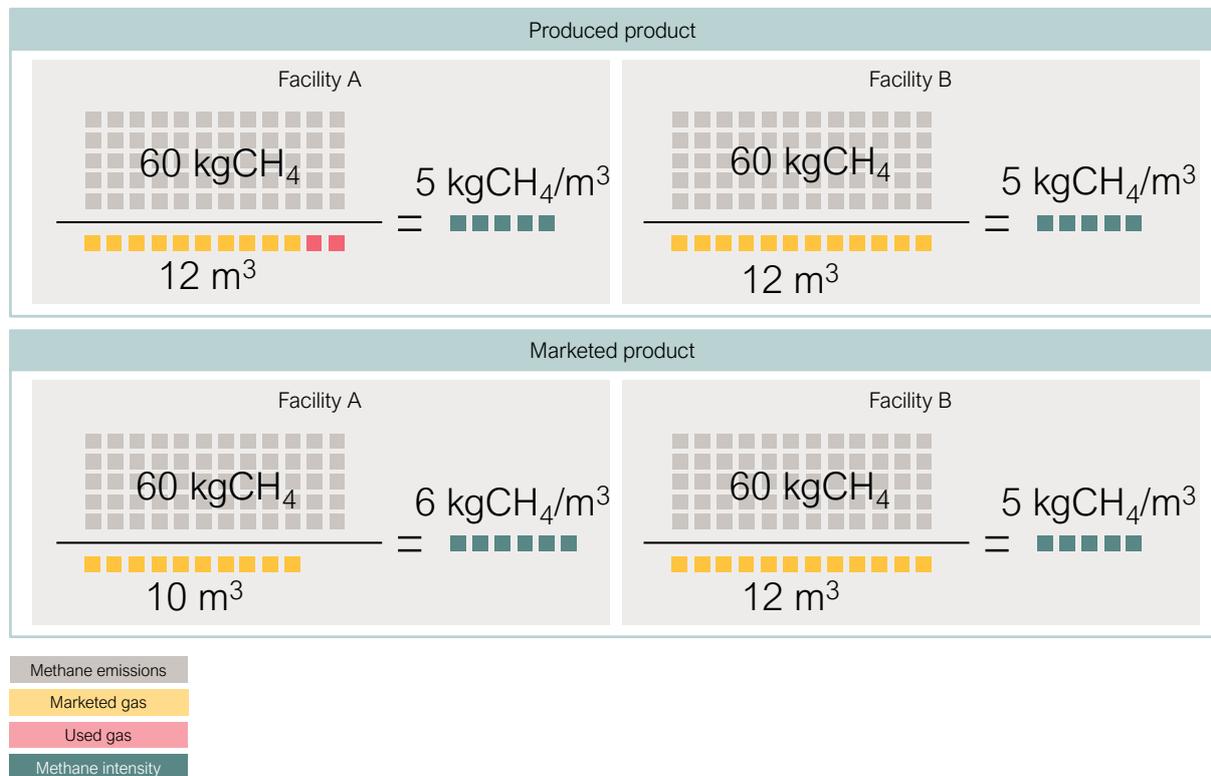


Figure 10 presents an example of two similar facilities in terms of emissions, where Facility A uses the gas on site to cover its power and heat needs, while Facility B imports its energy from elsewhere (e.g. diesel-powered engines). The impact it will have on their reported methane intensity is presented in the figure below.

When using produced product to compute methane emissions intensity, both facilities obtain the same value, while when relying on marketed product, Facility A has a higher methane intensity than Facility B.

Figure 10 – Illustration of the impact of using produced or marketed product in the denominator of the methane intensity formula, looking at 2 different producers



The use of marketed product to calculate methane intensity can serve to encourage reduction of venting and flaring volumes. Producer A may be encouraged to vent and flare less gas in order to increase their

marketed volumes, thereby lowering their reported methane intensity. Also, using marketed volume in the denominator does not encourage the use of gas on site instead of venting or flaring it, as those amounts are excluded from the calculation of methane intensity.

An alternative solution could be to use the sum of marketed product and on-site use and reinjection (but excluding gas leaked, vented or flared), to avoid creating a bias against companies that use or reinject produced gas.

Additionally, using a methane intensity formula that relies on marketed product could also discourage the on-site use of produced gas for power and heat generation. This could therefore incentivize the use of alternative sources of energy such as externally purchased fossil fuels, such as diesel or natural gas from the grid, even when utilizing on-site gas would be more efficient or sustainable. This issue is however addressed if the metric includes greenhouse gas emissions broader than just methane (expressed as CO₂-equivalent emissions), as in the Colorado AQCC rule.²¹

Summary

Produced product	
Pros	Cons
<ul style="list-style-type: none"> - Does not penalize on-site use or reinjection 	<ul style="list-style-type: none"> - Can be a difficult data point for the buyer to obtain
Specific considerations	
<ul style="list-style-type: none"> - <i>For single formula relying only on volumes of gas (e.g. OGCI)</i> Using produced gas works for all assets even companies who do not market gas 	

Marketed product	
Pros	Cons
<ul style="list-style-type: none"> - Data point that is available and can be controlled by the buyer - Could encourage reduction of vent and flare gas volumes - Directly relevant for life-cycle analyses - Already part of commonly used methodologies (OGCI, US regulation...) 	<ul style="list-style-type: none"> - Could create a disincentive to use product on-site for power- and heat generation or for reinjection, especially for metrics using only methane in numerator
Specific considerations	
<ul style="list-style-type: none"> - Could encourage on-site use and reinjection by including those amounts together with marketed gas and excluding flaring, vents, and leaks from the denominator. 	<ul style="list-style-type: none"> - <i>For single formula relying only on volumes of gas (e.g. OGCI)</i> Methane intensity can be very high or impossible to compute for companies that only market very small volumes of gas or do not market any gas at all.

The way produced or marketed gas is integrated into the methane intensity formula(s) influences how the different usages of non-marketed gas (used onsite, flared or reinjected) are encouraged or discouraged. To support reductions in wasted gas without discouraging onsite use, it can be recommended to include in the

²¹ This option is not detailed in this paper as the EU Methane Regulation only focuses on methane emissions.

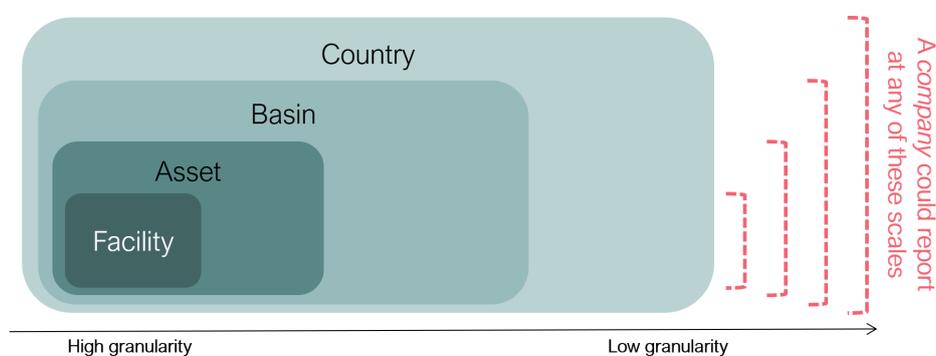
denominator not only marketed gas but also gas volumes used onsite for power and heat generation, as well as reinjected volumes.

3.3 Granularity

Depending on the scope, methane intensity can apply to products with varying levels of granularity. Granularity is here defined as the level at which emissions and activity data are aggregated to determine the average methane intensity within that scope. While the Methane Regulation states that intensity should be calculated at the level of the producer, a very granular methane intensity could consider the methane intensity of a producer's hydrocarbon products coming from a specific facility, while a methane intensity with limited granularity could consider the average methane intensity of a producers' products coming from an entire country. Methane intensities with intermediate scopes could, for example, be calculated at the asset level (a business or operating unit, which can be composed of several facilities or sites²²), at the basin level, or for a given company within an entire basin. The different possible granularity levels to consider for the definition of the methodology are illustrated in Figure 11.

Oil and gas companies worldwide come in very different shapes and sizes and can vary over time following investment and divestment cycles. Methane intensity could be considered at company level, however the scope that this level of granularity could cover is broad, from asset-level to regional or even global, since companies vary so much in size. Since global and regional (multiple countries) scopes would fall out of the Methane Regulation maximum granularity of country-level, in this section, international company-level granularity was not considered. Nevertheless, methane intensity could be considered for a specific company within a specific country or basin. This is discussed in the section dedicated to lower levels of granularity.

Figure 11 – Representation of different possible granularity levels to average and report a producer's methane intensity



Options for methane intensities more detailed than facility-level are not considered in this assessment. These would need to be set at the level of the well or production units which would lead to large variations in terms of activity data linked exclusively to variations in levels of well productivity. In addition, this would generate difficulties in quantifying and allocating emissions, as products from several wells or production units are typically gathered before the first stage of processing.

When selecting the levels of granularity at which methane intensity is calculated, several factors are to be considered, including: granularity and availability of reported emissions data and activity data, the possibility of attributing it to the imported product, as well as the level at which mitigation measures and regulation can be applied.

²² Definition as per Article 2 of the EU Methane Regulation

The EU Methane Regulation requires intensity to be determined at the level of the producer. In the regulation, “producer” currently does not have a detailed enough definition to clarify the level of granularity desired by the regulator. Once the term has been clarified, it is important to align granularity with the definition of “producer”.

Higher levels of granularity (facility, asset)

Methane intensity calculated at facility or asset levels can better reflect mitigation practices and efforts, and highlight differences in methane performance between different producers, even within the same basin or company. Carrying out emissions quantification with low levels of aggregation also allows producers to identify and prioritize their mitigation actions as it allows them to more precisely identify high emitting sources with high abatement potential and link these to specific mitigation projects.

This type of assessment, however, requires significant data collection and reporting efforts, which in turn necessitates more in-depth verification efforts, to assess the validity of the data. Very granular methane intensity not only requires significant changes to the collection or reporting of data but could also create the need for producers to install measurement devices (e.g. flow meters on wells, product meters within facilities, sampling, etc.) at a vast scale, where these do not exist at the moment and may demand high investment costs. In many countries or regions, emissions and activity data are quantified, collected and reported at high levels of aggregation.

Importantly, with higher levels of granularity, there could also be a risk for exporters to cherry-pick facilities or assets with lower methane intensities to export to the EU market in order to comply with the intensity limits, with little incentive to reduce emissions from other assets that continue to serve less regulated markets. For example, newer wells (with high production, and typically lower intensity as a result), could be designated as the origin of gas for export to the EU; as they age, with intensity rising as a result, they would be re-designated to serve other markets, to be replaced by newly drilled wells as suppliers for the EU market. This could create an adverse effect: the EU Methane Regulation would push products with high methane intensity towards less regulated markets, without incentivising significant methane emissions reduction. One way for operators to address this issue is by including all assets (or all assets within a production region or state/province) in the scope of their measurement informed inventory rather than selecting only certain assets. The Veritas Protocols, published by GTI, are one example of such emission protocols, where extrapolation of results to assets outside the designated scope is prohibited and the importance of transparency about which assets are or are not included is emphasized.²³

Overall, high levels of granularity will automatically lead to more variation in methane intensity due to variation on productivity, as well as the ability to specifically target low intensity products for export.

Lower levels of granularity (basin, country) –per operator

An alternative approach, a lower level of granularity could be used to calculate intensity per operator within a specific basin or country. For example, if several companies operate within the same basin, each could obtain a methane intensity for its own operations or products. Alternatively, if a company operates in two different basins within the same country, a methane intensity for the company’s operations would be determined for each of those basins or aggregated at country level, if considering country-level intensity. The characteristics of this method would largely correspond to those of lower levels of granularity such as lower levels of data requirements and reducing the risk of cherry-picking high-performing assets for export to regulated importers. while also incentivizing individual action on methane mitigation. This approach would

²³ Veritas Protocols (2023). GTI. https://saqticsprod01.blob.core.windows.net/gti-cms-prod/2025-05/GTI_Energy_Veritas_Measurement_and_Reconciliation_Protocol_Upstream_v2_18Dec2023.pdf, pgs. 14-15.

give individual action more weight compared to total production volumes of the basin and highlight good performers within a basin.

For intensities calculated at low levels of granularity at an operator level, the risk of cherry-picking low-intensity assets can persist if operators optimise asset or facility ownership to focus exclusively on the best performing facilities or assets within a given area, (for example by selling off more methane-intense assets to other operators, who would probably continue to serve less regulated markets). This could lead to only partial improvement of overall methane emissions performance of a basin or country.

Lower levels of granularity (basin, country) for missing emissions data

A lower level of granularity to calculate intensity within a specific basin or country, but without differentiation between operators active in the area, would not be consistent with the EU Methane Regulation, as this legislation requires intensity to be determined at the level of the producer. However, this approach could potentially be considered for volumes of fossil fuels for which no emissions data based on compliant MRV is available. In order to encourage operators with missing data to calculate and report emissions and create an environmentally protective margin of error, it could be recommended that any default (non-operator specific) intensity values are calculated to be conservatively high.

Methane intensity calculated at basin or country level without differentiation between operators active in the area, in theory, requires significantly less input data both in terms of production data but also in terms of data necessary to calculate emissions, but it comes with significant trade-offs. For instance, average or fixed values for methane content and/or energy content can be considered, should those parameters be used in the intensity formula(s), rather than determining those parameters for each facility or asset. In addition, satellite data can be leveraged both to determine average levels of emissions in the area but also to verify reported methane emissions. However, technical challenges may limit accuracy of this approach, particularly in areas with significant emissions from non-oil-and-gas-production sources (including midstream oil and gas sources), other important methane emissions sources (e.g. wetlands, landfills, cattle), and/or areas where geography is not suited for satellite observation.²⁴

A broader geographic scope metric, which does not distinguish between operators, could also, in theory, encourage methane emissions reduction at a larger scale, to improve the overall emissions performance in the area. However, it is important to consider that the incentives perceived by individual decision-makers may hinder the effectiveness of such an approach, since an individual operator would see a diminished return (in terms of intensity reductions credited to their products) for the operator's investments. Significant reductions would require collective investment, and in areas where some operators are not exporting to the EU, this could be more challenging to achieve. On the other hand, such an approach could potentially incentivize regulators with jurisdiction over an exporting nation or basin to enact policies to reduce emissions, as well as industry-level efforts within a certain country or basin. However, this approach is arguably a less direct path to mitigation than approaches that directly incentivize individual operators. It would most likely only be effective, in countries or basins where a significant portion of produced oil and/or gas is exported to the EU, or to other jurisdictions with similar intensity performance standards.

Not only does mitigation action risk being less visible when emissions data is less granular, it can also be more challenging to identify high emitting sources and map out specific abatement opportunities. If methane intensity is reported at higher granularities, it would require more detailed source-level inventories, which are essential for identifying mitigation opportunities.

²⁴ Shannon, S. (Ember) and Biniotoglou, I. (CATF), *The geography factor: How environmental conditions shape methane monitoring from space*, March 2025, <https://www.catf.us/resource/geography-factor-environmental-conditions-shape-methane-monitoring-space/>

Summary

Higher levels of granularity (facility, asset)	
Pros	Cons
<ul style="list-style-type: none"> - Allows better reflection of individual practices and mitigation efforts, with a possibility to highlight better-performing producers - Supports identification and prioritization of mitigation action 	<ul style="list-style-type: none"> - Limited data availability, will require significantly more data collection, reporting, and verification - Can more easily lead to cherry picking of best performing facilities or assets while products from lower-performing facilities or assets are exported to less regulated market

Lower levels of granularity (basin, country) – per operator	
Pros	Cons
<ul style="list-style-type: none"> - Incentivizes operators to measure and quantify their methane emissions - Opportunity for higher performing operators to benefit from their mitigation efforts - Lower levels of data required, can be assessed using area flux satellite data, where applicable 	<ul style="list-style-type: none"> - Risk of cherry picking of higher performing facilities or assets through optimised ownership structures - Less actionable for producers having not yet performed an individual assessment of their emissions.

Lower levels of granularity (basin, country) for missing emissions data	
Pros	Cons
<ul style="list-style-type: none"> - Lower levels of data required, can be assessed using area flux satellite data, where applicable - Could require improvement of methane emissions performance over larger areas 	<ul style="list-style-type: none"> - Less opportunity for higher performing producers to stand out - Less actionable for individual producers - Possible lack of data

Overall, higher levels of granularity would likely pose significant challenges in terms of data collection and create a significant risk of cherry picking high performing assets to export towards the EU while redirecting the products of others towards less regulated markets. Higher levels of granularity are therefore not recommended for the design of a methane intensity methodology. Different options can still be considered for lower levels of granularity, including values per operator or at basin/country level.

3.4 Scope of the production activities

As per the EU Methane Regulation, producers in the EU and importers shall report “methane intensity of the production of crude oil, natural gas and coal placed by them on the Union market” (Article 29). The Regulation defines ‘producer’ as “an undertaking which, in the course of a commercial activity, produces crude oil, natural gas or coal, by extracting it from the ground in a licensed area, processing it or conveying it through connected infrastructure within that licensed area.”

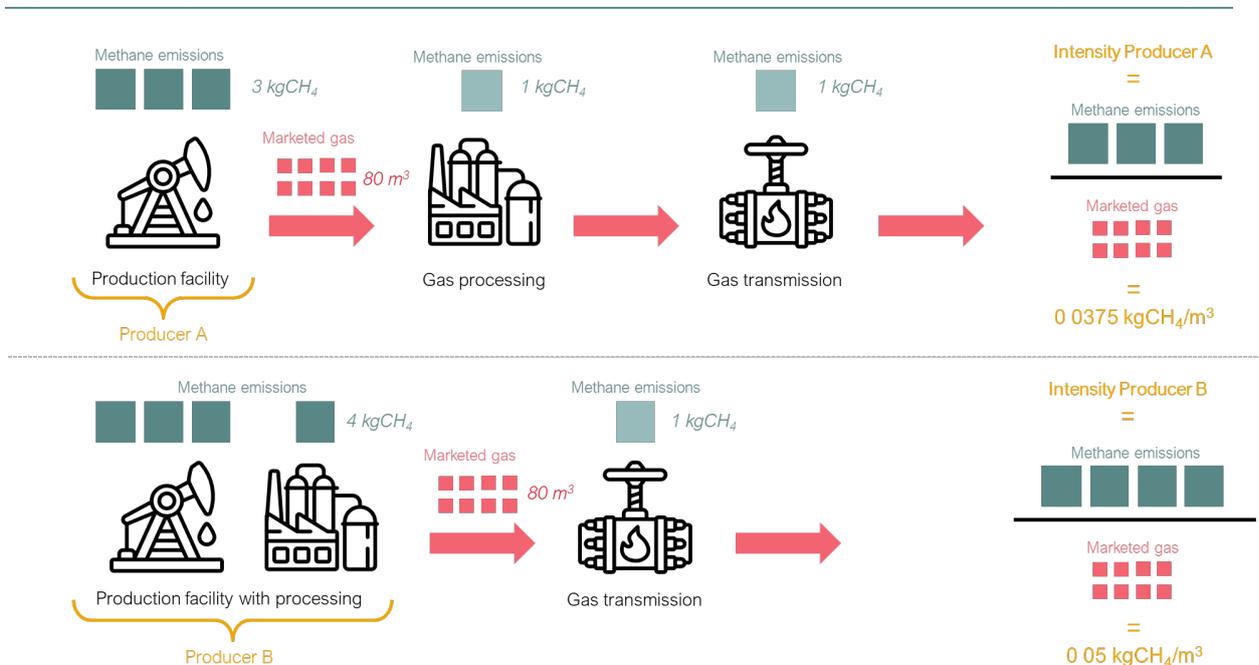
In this context, methane intensity calculation only applies to the upstream sector at the level of the producer, which should include all equipment within a licensed area. For licensed areas onshore, this can include well pads, gathering systems dedicated to that area, and centralized processing and separation facilities. For

licensed areas offshore, this may include production platforms, subsea wells, tiebacks, and associated floating production storage and offloading units.

It should be noted that in some cases, while some producers may have equipment dedicated to gas boosting or gas treatment (or pre-treatment) in the licensed area, others do not. Licensed areas may exclusively contain well heads, while in other jurisdictions also include separators, storage tanks, dehydrators or other processing or boosting equipment. This means that when considering facility emissions, some facilities may have additional emission sources included in their inventory and estimation of total methane emissions.

Inconsistent system boundaries may lead to unequal treatment of producers, as illustrated in Figure 12. Producers that cover a broader range of activities might obtain a higher intensity. In the example below, the two value chains have the same methane emissions for production, for gas processing and for gas transmission, and have the same volume of gas marketed. However, the production site of producer B includes some gas processing equipment while the site of producer A, does not. Consequently, the calculated intensity for producer B is larger than for producer A, despite having the same level of production and the same volume of emissions across all activities.

Figure 12 - Simplified representation of two value chains from production to transmission of processed gas



Note: Numbers used and the relative importance of emissions in each process is purely for illustrative purpose.

To avoid confusion and provide consistency in how methane emissions intensities are interpreted between sites with different equipment, it would be necessary to clarify the scope of activities included within a producer's licensed area and provide requirements for dealing with sites with integrated activities that include gas processing, and sites without these integrated activities. Such requirements could include requiring producers to provide a transparent description of what lies within its licensed area and operational control, and declare whether they are reporting an intensity for extraction only, or an intensity for extraction and processing, which would allow the European Commission to create separate intensity thresholds for different sites with different boundaries. These clarifications should also include attribution rules for shared processing and gathering facilities.

Clarifying the scope of activities helps make use of the methane intensity beyond reporting to the competent authorities. Indeed, buyers may be interested in accounting for methane emissions along the whole value chain of products (for instance, including gas transmission). In that perspective, clear system boundaries can help prevent double counting or omission of emissions along the value chain.

Furthermore, a strict scope definition can increase the amount of data processing required: producers might need to, in some cases, select a subpart of their reported emissions or aggregate emissions from several assets to align with the given scope. This places a burden on the producers, particularly when they already report their emissions or intensity in their jurisdiction using a different scope. For example, some companies with integrated value chains may only report an aggregated number across all their activities to local authorities and may therefore have to re-compute emissions by segment to align with the segment definition provided by the EU. This additional step increases the risk of errors and inconsistencies. It can also make verification more cumbersome, as the verifiers would need to verify the allocation of emissions to the different segments of the value chain.

Specific guidelines about production scope	
Pros	Cons
<ul style="list-style-type: none"> - Ensure comparability between producers - Improve consistency of value-chain methane intensity calculations by reducing the risks of double-counting. 	<ul style="list-style-type: none"> - Additional processing of information by the producers to make their calculations fit the scope increases the risk of errors. - Could increase the number of parameters to report and verify. - Can make verification work with satellite data more challenging: in addition to attributing emissions at basin level to certain facilities, they might need to be split between processes within the facility. - Might face resistance from operators who already report in their jurisdiction but with a different scope

3.5 Gas volume vs. methane volume

Methane intensity can be calculated using either the quantity of gas emitted or the quantity of methane within that gas. The latter is derived by multiplying the total gas volume by the methane content of the natural gas. Similarly, for the denominator, some methodologies use total gas throughput, while others apply the methane content to determine the amount of methane in the produced or marketed gas. Below, we explore the advantages and disadvantages of incorporating this conversion into the formula.

Converting the total gas volume (produced or marketed) into the corresponding methane volume can present some challenges. This approach requires oil and gas operators to regularly measure, and report detailed information on the methane content of natural gas, potentially increasing the reporting burden. Defining a generic methane content value within the methodology, like other conversion factors in existing methane intensity frameworks, could improve comparability across companies' operations and processes. However, such standardization, in particular for the upstream segment, fails to account for the varying methane content between fields, leading to a misrepresentation of reality and a reduction in overall accuracy.

Including facility- or company-specific methane content values in calculations could enhance the accuracy of methane intensity methodologies, offering a more realistic representation of methane emissions and their climate impact. However, this flexibility introduces risks of additional uncertainty of the reported numbers through the use of additional parameters, necessitating additional verification efforts to ensure integrity and consistency.

One option that could help resolve this issue would be to use marketed gas in the denominator, given that marketed gas typically has to meet specific and more generalized standards of percent methane by volume, thus reducing the variability in the methane content by volume.

Conversion using methane content has significant trade-offs in terms of accuracy, complexity, and the potential for manipulation, each adding operational and verification burdens on the oil and gas industry as well as verifiers and regulators. Stakeholders have expressed a preference for simplicity in the formula and methodology that will be defined. If a methodology requiring conversion is adopted, those conversion factors should be clearly defined to maximize applicability and ease of verification.

3.6 Units of output

Currently, different methane intensity calculations yield different units of output. Some methodologies present methane intensity as a percentage, like the one from OGCI, while others present methane intensity relying directly on the units used in the formula (e.g. kg CH₄/MJ), like one from IEA.

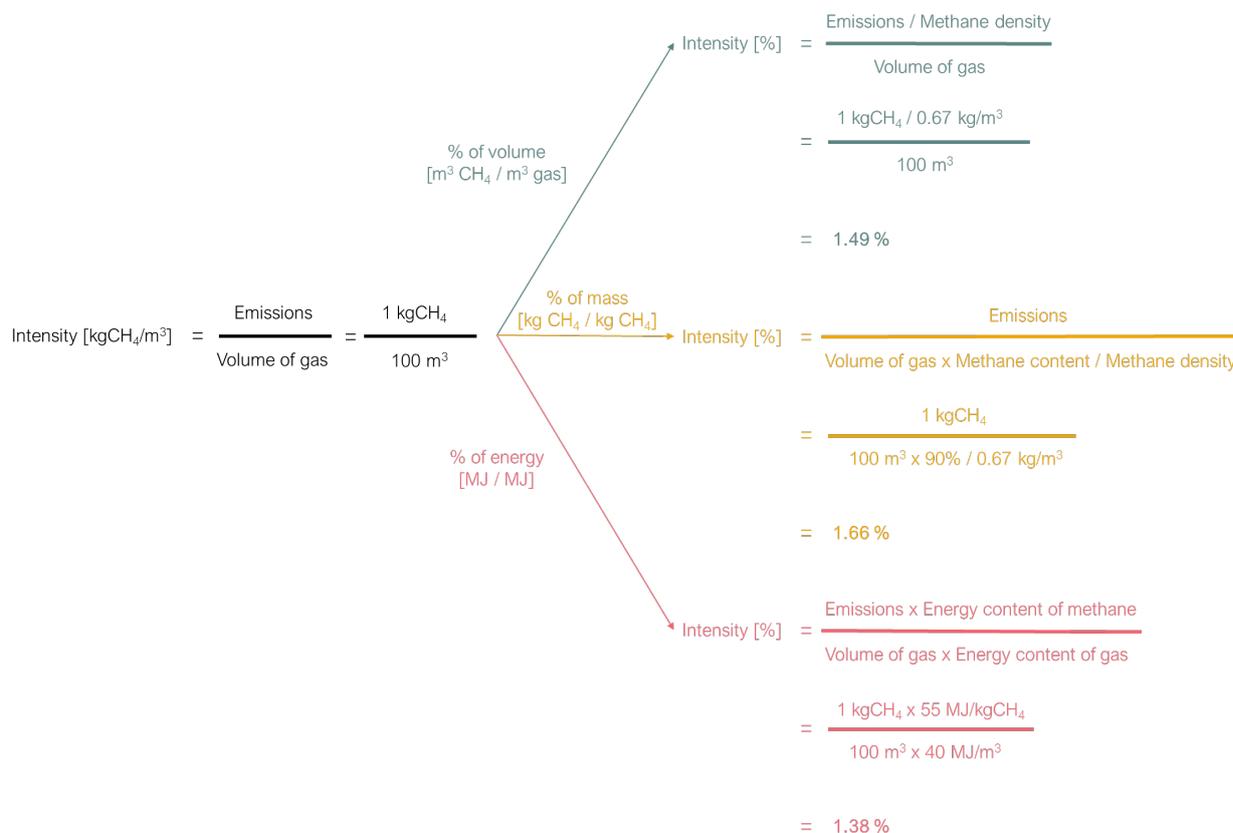
Output as percentage

Expressing methane intensity as a percentage is currently widely used in the industry to present methane performance as well as targets. For example, the OGCI methane intensity collective target of 0.2% is regularly communicated on by the industry.

A percentage is also intuitive and accessible to a wide range of stakeholders in and outside the industry. It favours simplicity and helps with clear communication. For example, a 1% methane intensity, considered as 1% of total production that is emitted to the atmosphere, is an easy-to-understand metric that non-experts can easily comprehend.

However, the use of percentage may also be confusing if the associated methodology is not communicated along with the number. As shown in Figure 13, the same amount of emissions per unit of gas can be represented by different intensity numbers depending on whether percentages are calculated based on the ratio of volume, the ratio of mass or the ratio of energy. Thus, only percentages that represent the same ratio can be rightfully compared. The use percentages can create a false sense of understanding leading stakeholders to not take the proper precautions when putting numbers in perspective and deriving wrong conclusions.

Figure 13 – Example of methane intensities calculated as percentage



Note: Numbers used are for illustrative purpose. The conversion factors (densities, energy content etc.) may vary depending on location and environmental conditions.

In addition, to arrive at a percentage, some unit conversion, compared to the input data might be necessary and might require some assumptions on, for example, the energy content or the methane content of the gas. This can add complexity in computing the methane intensity and can make the value harder to verify if these assumptions are not clearly communicated alongside the methane intensity value.

Output as units

Other methodologies express methane intensity directly in the unit in which it is calculated. This is the case, for example, of the IEA or the Colorado AQCC rule, which expresses methane intensity in terms of the mass of methane emissions per unit of energy produced (i.e. kg CH₄/MJ, Mt CO_{2e}/boe). While expressing methane intensity this way helps to clarify the input data used in the calculation and does not require additional unit conversion, it can be less intuitive for non-experts. Having a clear representation of a unit of energy or a unit of emissions can be difficult. Furthermore, the use of specific units is less common in the industry when setting methane intensity targets, which could make the adoption of a different approach more challenging.

On the other hand, the additional flexibility that methane intensity expressed as units through the use of different scale for each unit (e.g. relying on TJ rather than MJ or relying on t CH₄ rather than kg CH₄) can help depict small variations in methane intensity in a way that can be easier to understand. For example, a change of 0.01% in methane intensity might seem almost insignificant, but if expressed in terms of kg CH₄/TJ this would represent a change of 180. This allows to better highlight differences between methane emissions performance. Therefore, beyond unit, it could be beneficial to also define the scale at which producers will need to report (e.g. tons or kg of methane, GJ or MJ of energy). Standardized output units, including associated orders of magnitude, allow for easy comparison between operators and reduce risks of misinterpretation of results.

Output as percentage	
Pros	Cons
<ul style="list-style-type: none"> - Easy to understand - Widely used 	<ul style="list-style-type: none"> - Potentially requires additional unit conversions as well as potential assumptions for conversion (energy content, methane content of the gas) - Need to make sure that the numbers represent the same ratios before making comparison. Risks creating a false sense of understanding

Output as units	
Pros	Cons
<ul style="list-style-type: none"> - Clarity on input data used - Can better reflect smaller variations in emissions, depending on the choice of unit (in particular when emissions are very small compared to the levels of production) 	<ul style="list-style-type: none"> - Less widespread across the industry - Difficult to interpret

3.7 MRV considerations

Independently of the methodology chosen to calculate methane intensity, the numerator will be based on the estimated methane emissions. Therefore, the reliability of the calculated intensity is directly dependent on the quality of the data on emissions. Emissions data must result from a robust monitoring, reporting, and verification system (MRV). As part of articles 8, 9, and 12, the EU Methane Regulation establishes MRV requirements for operators in the EU. Those requirements elaborate on the highest levels of OGMP 2.0 reporting, which is considered industry best practice, and add an independent third-party verification component. The EU's MRV rules will be supplemented with further technical standards for measurement and quantification of methane emissions, which the European Commission will issue through a delegated act, set forth in Article 32. These standards will be informed by the ongoing CEN and ISO standardisation processes, launched at the request of the European Commission, and expected to conclude in 2027. Article 28 extends the requirements to producers outside of the EU, providing numerous pathways to demonstrate MRV equivalence at either the country or company level. In principle, all methane intensities reported by producers and importers in the EU should therefore be based on high-quality emissions data.

The methodology for methane intensity calculation should define a minimum acceptable data quality (equal to the requirements set out in articles 8, 9 and 12) and could also set forth a process for assigning default basin-level intensities that are informed by compliant MRV data. The objective is to avoid that domestic or foreign producers see a benefit in reporting low methane intensities based on poor quality data, as it has been demonstrated previously that quantification methods relying on lower quality data tend to underestimate total methane emissions from the oil and gas sector^{25 26 27}. For instance, methane intensities

²⁵ Sherwin, E., et al., *US oil and gas system emissions from nearly one million aerial site measurements*, 2024, <https://pubmed.ncbi.nlm.nih.gov/38480966/>

²⁶ Barkley, Z. R., et al., *Analysis of Oil and Gas Ethane and Methane Emissions in the Southcentral and Eastern United States Using Four Seasons of Continuous Aircraft Ethane Measurements*, 2021, <https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2020JD034194>

²⁷ Riddick, S. N., and Mauzerall, D. L., *Likely substantial underestimation of reported methane emissions from United Kingdom upstream oil and gas activities*, 2023, <https://pubs.rsc.org/en/content/articlehtml/2022/ee/d2ee03072a>

that are not based on reliable emissions data could by default be considered as not complying with the maximum methane intensity values set out by the Commission.

Box 3 3 – Inclusion of super-emitting events

A super-emitting event is an event “where a source or a set of closely connected sources in a site emits above 100 kg of methane per hour” (Article 2). Because they can be time-limited and are not part of regular operations, those events may be underreported or absent from producers’ methane inventories. Yet, they can contribute greatly to the overall yearly emissions and should therefore be included in the calculations. The EU Methane Regulation also addresses the topic of super-emitting events through its rapid reaction mechanism (article 31).

The methodology for methane intensity calculations should therefore clarify how super-emitting events are to be accounted for. Pursuant Article 31, the EU Commission will establish a rapid reaction mechanism to address super-emitting events, by notifying the Member State or third country in which the event has taken place and requesting information on the remedial measures taken. This mechanism could be leveraged to account for super-emitting events, but the limitations of satellite technologies must also be considered. For instance, some areas are more suitable for satellite observations than others, which may bias the number of detections towards certain regions.

Other technologies also allow the detection of super-emitting events, such as sensors deployed in drones or airplanes, or continuous monitoring solutions. Data from these sources could also be considered to ensure that super-emitting events are properly accounted for. However, it is important to note that these solutions also present some limitations which can limit the consistency of monitoring for super-emitting events and their reporting. Aerial solutions tend to require flight authorizations and are typically less suited to systematic collection of data than satellites as they require dedicated campaigns to be organized. Continuous monitoring, on the other hand, while allowing for systematic monitoring, often requires access to site and the data coming from these systems is typically only available to the operator. In addition, these technologies can currently be quite expensive and are not available in all markets, which can create imbalances in the level of coverage of monitoring of super-emitting events.

Beyond methane emissions estimates, the reliability of the calculated numbers for methane intensity also depends on the data quality of the other parameters required for calculation. Minimum MRV requirements should therefore also be set for different parameters, depending on the methodology that is adopted: volume of marketed products, volume of produced products, energy content of the products, methane content of the gas, *etc.* MRV requirements could include a list of accepted methodologies or technologies for the quantification of the parameters, considerations regarding the frequency at which the parameters must be quantified, a fall-back approach when the information is not available, and a description of the verification process. As mentioned in the previous sections, some information may already be known and reported in their jurisdictions by producers as part of legal requirements pertaining to their regular operations and may already be audited, or covered by the application of recognized international standards, such as some of the ISO standards. For example, this could be the case of marketed volumes or energy content.

Even though major concerns regarding MRV practices are addressed by the requirements set out in articles 12 and 32, it is recommended to put in place proper fall-back approach in case of low data quality to ensure that producers and importers do not benefit from reporting a low intensity based on unreliable data.

4 Conclusion

A methane intensity calculation methodology can take various shapes and sizes, each of which can ultimately have an impact on how the performance of different types of producers is assessed and how the industry decides to manage their methane emissions. The nuances in the definition of a methane intensity,

as explored in this paper, highlight the importance of carefully weighing a range of considerations to ensure the methodology is both robust and practically applicable across the industry.

Key decisions, such as whether to use a single or separate formula for oil and gas methane intensities and how it is implemented, will impact the comparability of the results and can impact the scoring of the performance of producers. Some considerations, such as the selection between produced or marketed product as the denominator, can impact how producers approach mitigation efforts. Granularity and segment definition can introduce other dimensions for producers, both in terms of the level of understanding of methane emissions and the impact of mitigation on the calculated methane intensity for these producers.

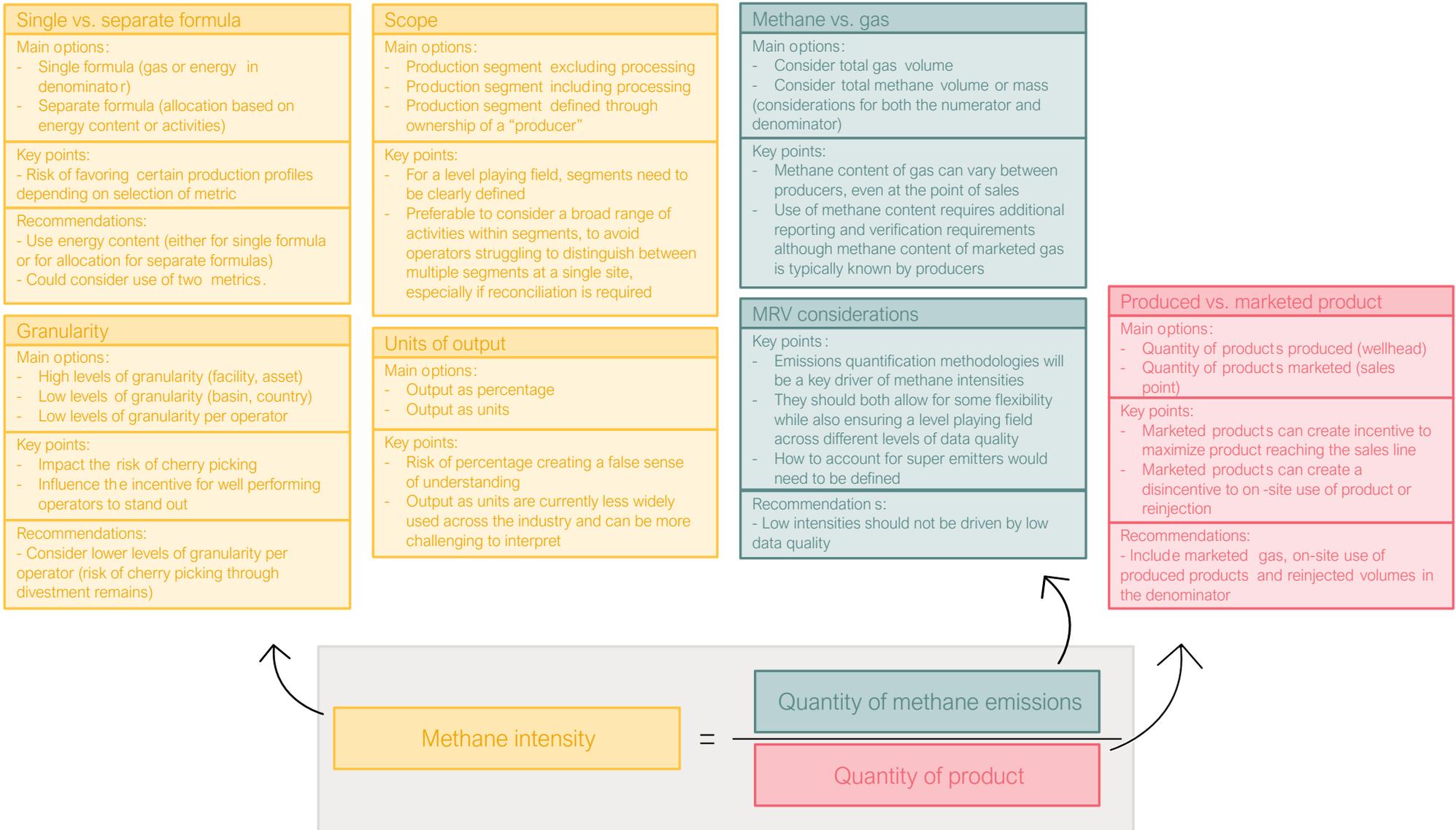
Other parameters can also come into play and influence the comparability and accuracy of methane intensity calculations, including conversion factors and units of output. Monitoring, Reporting, and Verification systems are also essential, as they ensure the accuracy of the emissions and therefore, the numerator used to determine the methane intensity of the different producers.

It is also important to consider existing practices in the industry, both in terms of formula and unit of output, to facilitate the adoption of a new methane intensity methodology, as well as maximum methane intensities further down the line.

Every methodology will have its benefits and drawbacks, as discussed throughout this paper, but it is essential that these trade-offs are actively considered through the process of methodology selection. Transparency around the impacts of key decisions, both on the calculation itself and on the broader implications for the industry, will be crucial to fostering trust, essential to driving meaningful methane reductions.

Figure 14 summarizes the main options, key points and recommendations for each key consideration discussed in the document.

Figure 14: Summary of main options, key points and recommendations for each key consideration discussed in the document



5 Annexes

5.1 Stakeholder workshops

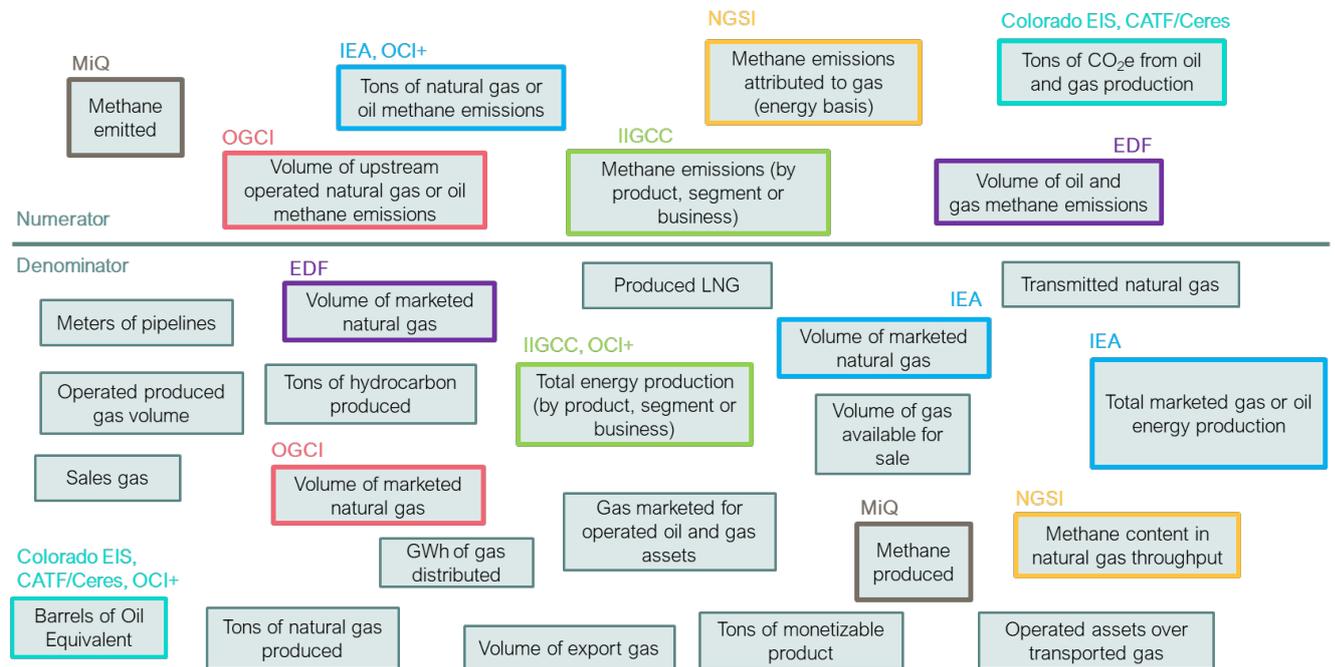
To inform this white paper and ensure the inclusion of points of view from a variety of stakeholders, two workshops were held in September and October 2024, with the intention of collecting feedback from participants. Workshop participants were organized in breakout groups of 10 or less, and were able to discuss the different methodologies to compute methane intensity and their pros and cons. To do so, several alternatives were presented to participants (e.g. *is it better to use a combined methane intensity for oil and gas or is it better to develop separate formulas?*) to list benefits and drawbacks of the different approaches. The workshops were conducted under Chatham House Rules. Therefore, contributions will not be allocated to specific participants.

Representatives from the following organizations took part in the workshops:

2Celsius, German Federal Institute for Geosciences and Natural Resources (BGR), Bloomberg, Boling Energy, bp, Bureau Veritas, Climate Action Network (CAN) Europe, Capterio, Carbon Mapper, Clean Air Task Force (CATF), Colorado Department of Public Health and Environment (CDPHE), Columbia University, Environmental Action Germany (DUH), Ecologic, Environmental Defence Fund (EDF), United States Energy Information Agency (EIA), ExxonMobil, GTI Energy, International Energy Agency (IEA), Institute for Governance and Sustainable Development (IGSD), Instrat, Massachusetts Institute of Technology (MIT), MiQ, Nigerian Upstream Petroleum Regulatory Commission, Nigerian Midstream and Downstream Petroleum Regulatory Authority (NMDPRA), Nigerian National Petroleum Company (NNPC), Offshore Energy UK (OEUK), Oil and Gas Climate Initiative (OGCI), Oil and Gas Decarbonization Charter (OGDC), Oxford Institute for Energy Studies (OIES), Project Canary, Repsol, Rocky Mountain Institute (RMI), Shell, SLR Consulting, Sonatrach, TotalEnergies, United Nations Environment Programme (UNEP)'s International Methane Emissions Observatory (IMEO) and Oil and Gas Methane Partnership (OGMP).

5.2 Methane intensity metrics used by different organizations

Figure 15 – Examples of metrics used by different organizations to calculate methane intensity



Note: Units for the denominator that are not framed in color are used by certain companies to report their methane intensity to OGMP2.0. The metrics presented come from the review of: Colorado EIS: [Colorado Air Pollution Control Division, Oil and Natural Gas Methane Intensity Verification Protocol, April 22, 2024](#); EDF: [Environmental Defense Fund, Plugging the leaks. An investor guide to Oil and Gas Methane Risk, 2023](#); IEA: [International Energy Agency, The Oil and Gas Industry in Net Zero Transitions, World Energy Outlook Special Report, 2023 and International Energy Agency, Global Methane Tracker, 2024](#); IIGCC: [Institutional Investors Group on Climate Change, Addressing methane emissions from fossil fuel operations, 2024](#); MiQ: [MiQ-Highwood Index™ : A national-scale measurement informed methane intensity for the United States, 2023](#); NGSI: [Edison Electric Institute \(EEI\) and American Gas Association \(AGA\), Natural Gas Sustainability Initiative Methane Emissions Intensity Protocol Version 2.0, September 2024](#); OCI+: [Rocky Mountain Institute, Oil Climate Index + Gas Methodology, 2024](#); OGCI: [Oil & Gas Climate Initiative \(OGCI\), Reporting Framework, October 2023](#); OGMP: [United Nations' Environmental Program, OGMP 2.0 company reporting fact sheets, 2024](#)

5.3 Methane intensity beyond the scope of the EU Methane Regulation

Although the EU Methane Regulation limits methane intensity methodologies to the oil and gas production segment, the concept of methane intensity can be applied across all segments of the oil and gas value chain, including midstream and downstream operations. Expanding methane intensity calculations to these additional segments requires clear methodologies to ensure consistency, avoid double counting, and maintain comparability.

First, the scope of each segment must be clearly identified to avoid double counting or omissions of activities and emissions. Then, methane intensity may be required to be reported with various levels of granularity: as an aggregate value for a product encompassing all segments, by segment, or by activity within the segment. For example, for midstream and downstream operations, methane intensity can be calculated separately for activities such as processing, transmission, storage, and liquefied natural gas (LNG).

To aggregate emissions associated with a product placed on the market from different segments, the methodology must provide clear guidance on how to combine methane intensity values across the value chain. This requires alignment in the units used for methane intensity calculations at each stage of the chain. Consistency in units and conversions is essential to ensure accurate summation and comparability.

Key considerations for a globally applicable methane intensity methodology include:

- **Clear Segment Boundaries:** Defining precise boundaries for each segment is critical to prevent double counting or omission of emissions across overlapping processes or activities. This ensures that emissions are neither overlooked nor overrepresented in the aggregated intensity values.
- **Compatibility of Units and Conversions:** A global methodology must adopt consistent units for methane intensity (e.g., emissions in units of energy, volume, or mass) and define clear conversion factors where necessary, across the entire value chain. This facilitates seamless aggregation of emissions across different segments.
- **MRV Systems for Quantification:** Monitoring, Reporting, and Verification (MRV) systems must be well-defined for all segments and activities covered, ensuring that the accounting of emissions in the numerator is consistent and comparable across all producers, and that distortions are not introduced as a result of varying levels of data quality across the value chain. This includes specifying methodologies for source- or site-level measurements, defining the technologies to be used, the frequency of measurements, and approaches to address uncertainties. Establishing clear standards for data collection and validation is essential to maintain consistency and comparability across regions, segments, and operators.
- **MRV Systems for Traceability:** Robust MRV systems are also crucial for ensuring the traceability of methane emissions. Such systems should enable tracking of emissions at each stage of the value chain, from production to final consumption, while maintaining data transparency and integrity. Methane intensity methodologies should account for the complexities of global supply chains, such as traded LNG or gas transported across multiple regions. Tracking emissions across transnational operations adds complexity but ensures comprehensive accounting.